Critical Realism, Post-Keynesian Economics and the Sraffian Question

by

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Abstract

The aim of this essay is threefold: to explain critical realism as it applies to economics, to consider critical realism as the methodological foundation for post-Keynesian economics and to assess whether or not the Sraffian approach is compatible within a post-Keynesian economics grounded on critical realism (CR). Part one introduces CR by contrasting it with empirical realism, the methodological position argued to direct orthodox economics. The case for CR as an alternative methodology is corroborated by demonstrating the substantive shortcomings of an orthodox economics grounded on empirical realism. A procedural outline for critical realist inquiry is given. Part two begins with a brief sketch of the evolution of post-Keynesian thought, focusing on the recent methodological turn in the discourse. In a bid to achieve coherency within the school of thought, the proposal to recognize CR as the methodological foundation of post-Keynesianism is sketched. The similarities between critical realism and previous articulations of post-Keynesian methodology are shown. Part three addresses the issue of compatibility between a CR-grounded post-Keynesianism and the methodological approaches of the strands that compose the post-Keynesian school. Specifically, the alleged deductive formalism of the Sraffian approach is scrutinized. This assessment leads to a suggested reorientation of the Sraffian approach that allows it to be consistent within the new methodological framework.

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1 Introduction

It is an interesting time to be thinking about economic methodology. Discussions about methodology during the 1980s and 1990s have moved away from matters of positivism and Popper towards issues of rhetoric and realism (Peter 2001:571). This shift in the debate corresponds with movements on campuses in the new millennium that question both the underlying assumptions and relevance of the conventional economic curriculum.[1]

This essay addresses one of the topics present in this larger discussion. The philosophical position known as critical realism and its relation to economics is the subject of the following study. Three questions will be asked:

- What is critical realism?
- Can critical realism provide a methodological foundation for post-Keynesian economics?
- What are the implications of critical realism for the Sraffian strand of post-Keynesian economics?

Section one begins with a description of the philosophical framework and model of scientific explanation in which orthodox economics is embedded. This philosophical framework is identified as empirical realism. Variations in modes of explanation that characterize orthodox economics practice, namely pure theory and instrumental positivism, are discussed. Next, the problems found in the orthodox economics approach are cited. Surface observations of prediction failure, inadequate explanatory power, persistent refutation of theories and the dubious efficacy of some research programs

[1] Examples of such movements are the Post-Autistic Economics Movement in France, the Cambridge Students' Proposal, the Kansas City Proposal and the recent petition to introduce a new introductory

under the orthodox mantle are interpreted as symptoms of deeper intrinsic features of orthodox economics methodology.

This critique of the empirical realist foundations of orthodox economics is followed by an explanation of critical realism as a superior alternative. Its ontological and epistemological position is described and its principles are contrasted with empirical realism. In particular, the social theory endorsed in critical realism is stated.

The proceeding section is of practical interest to the researcher. It outlines the procedure for inquiry and explanation within a critical realist framework. Procedures for pure and applied explanation are delineated with emphasis on its distinguishing characteristics: the role of demi-regularities, the significance of retroductive inference, the practice of abstraction, selection of theory, and the epistemic status of critical realist-grounded explanations.

Section one concludes with a return to empirical realist-based methods which define orthodox economics practice. To demonstrate the problems encountered when identifying constant event conjunctions using closed system models, particular practices within pure theory and econometrics are discussed.

Having an explanation of critical realism in place, the second section explores critical realism as a methodological framework for post-Keynesian economics. This exploration is situated in the context of the evolution of the post-Keynesian school and its thought. More specifically, the coherency debate of the late 1980s/1990s is described. The question of where the post-Keynesian school finds its coherency is discussed. The suggestion that the post-Keynesian school achieves its coherency on the level of

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economics course at Harvard that would cover a broader spectrum of views. Visit the website www.paecon.net.

methodology, specifically in its shared concern for realism ushers in the Lawson-Dow proposition.

Given the similarities between critical realism and post-Keynesian thought at a philosophical level, it is proposed that post-Keynesians explicitly recognize critical realism as providing its philosophical perspective. This recognition of critical realism is shown to be compatible with the Babylonian perspective that was once claimed to characterize the philosophical stance of post-Keynesians. Also, it is argued that the endorsement of the Lawson-Dow proposition would emphasize a greater methodological awareness among post-Keynesians.

In the final section, the question of whether critical realism provides the appropriate basis for post-Keynesian economics is addressed. More precisely, does the adoption of critical realism prohibit certain methodological practices used by post-Keynesians? The deductive formalism of the Sraffian strand comes under scrutiny. Some post-Keynesians who have embraced critical realism as their philosophical framework argue that the Sraffian approach is not compatible with the open systems orientation of a coherent post-Keynesian economics. This section features a lengthy exploration of the methodological issues related to the Sraffian approach. An assessment of the compatibilities and differences is made. A reorientation of the Sraffian approach that is consistent with a critical realist post-Keynesian economics is offered.

2 Critical Realism

Critical realism is a philosophical framework in which to conduct social scientific research including economics. The framework acts as an underlabourer[2] for research. It does not offer any substantive theory (Lawson 1994: 525-526). Yet it implicitly gives procedural guidelines.

Critical realist thought has its roots in Immanuel Kant's transcendental philosophy although the theory that is considered here is found in the writings of British philosopher Roy Bhaskar. Bhaskar's general theory of science is termed *transcendental realism* while his specific theory of social science is referred to as *critical realism.* Economic theorist Tony Lawson has adapted Bhaskar's critical realist thought for the economics discipline. It is Lawson's interpretation that is used here. The main text is *Economics and Reality* (1997).

The following will provide an explanation of the ontological and epistemological position of critical realism by contrasting it with its purported rival framework, empirical realism. The implications of critical realism for methodological procedure in economics will then be outlined. The advantages of a critical realist methodology become apparent when examining the problems that arise in the empirical realist approach through its reliance on closure devices.

2.1 Empirical realism and scientific explanation.

Critical realism may be seen as part of a reaction to the crisis in the philosophy of science witnessed in the mid-20th century. The demise of the positivist "received view"[3]

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[2] Underlabourer is a Lockean term for an agent that philosophically clears the metaphysical road for scientific inquiry (Osborne 1992: 81).

[3] "Received view" is an expression used by F. Suppe to describe the philosophy of science consensus between the 1920s and 1950s (Suppe 1974). Cited in Blaug 1992: 3.

of science has given way to various positions on the epistemological status of scientific knowledge and the normative conduct of science. Such positions include Popper's falsification prescriptions, Lakatos's appraisal criteria of scientific research programs, Kuhn's relativism, Feyerabend's methodological anarchism, the sociology of scientific knowledge school and postmodernist/constructivist approaches to science, just to name a few. Critical realism (CR) argues that science[4] is possible, but opposes what it sees as the conventional ontological-epistemological paradigm that underpins the positivist philosophy of science. CR identifies this paradigm as *empirical realism* (ER).

According to the critical realist account, empirical realism owes much to David Hume's empiricist philosophy. Hume proposed that while there is a reality external to the mind consisting of real objects, human beings can only come to know these objects through observation of the surface properties of these objects. Properties of these objects and their relations to each other that may exist at a deeper, unobservable level cannot be doubtlessly known. They remain beyond our sensual perception. Any speculation of their existence does not constitute true knowledge. Scientific knowledge hinges on observations (existing in the empirical domain) of surfaces of objects (existing in the actual domain). This Humean epistemological skepticism may be summarized as *what you see is what you know*.

To illustrate, consider a game of billiards. We observe the red ball hitting the white ball which is instantly followed by the movement of the white ball. We tend to conclude that there is a necessary causal relation between the two balls. This inductive inference is grounded on our past experience of these two singular events (separable in thought) which are observed in convincing regularity. However, the inductive inference

[4] Science is defined here as knowledge of objects whose existence are independent of the mind.

that there exists a necessary causal relation cannot be demonstrated to be strictly true and we must remain skeptical of its existence. Of what we can be certain is that there is a constant conjunction of events involving the two balls. An explanative statement or law of nature would have the form *whenever x, then y*. Whenever the red ball hits the white ball, the white ball moves.[5] The task of scientific investigators is to analyze surface observations in an effort to discover constant event conjunctions that can be generalized as universal relationships between objects.

The post-Humean concept of science has undergone three significant developments that have culminated in what is recognized as the *covering law model* of scientific explanation. The first development was the empirical verification argument of the Vienna Circle of logical positivists. This extreme position is best summarized by Ernst Mach who stated "if you can't verify something empirically then you should doubt its existence" (Bernard 1994: 12). Under this position, statements demonstrating the existence of atoms are not scientific in the epistemological sense. Invoking Humean-inspired skepticism against the logical positivists' empiricist dogmatism, Popper responded with his falsification thesis. This refuted the verification principle, ending the logical positivist reign in the philosophy of science. A proposition has meaning only if it can be shown to be true or false, i.e. shown to be falsifiable. There are logical forms of truth and factual forms of truth. Logical forms of truth can be deductively demonstrated. Factual truths can only be demonstrated through experience, i.e. verified though observation (Osborne 1992: 151).

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[5] However, it has been pointed out that this model of scientific explanation requires the additional Aristotelian condition that the explanation is directed from causes to effects, and not from effects to causes. For example, it is not sound to state that 'whenever the white ball moves, the red ball hits the white' (Niiniluoto 1999: 191).

From this position, Popper, along with Hempel, constructed the deductive-homological (D-N) or the covering law model[6] where scientific explanation is a deductive argument containing at least one universal law among its premises. Laws of causation re-enter the discourse as deductively-derived necessity-demonstrating universal laws. The model features the *explanans* and the *explanandum*. The explanans is composed of statements of initial conditions and statements of general laws or lawlike statements. The explanandum is the statement of the hypothesis, a description of the observed phenomenon. The explanandum is logically deduced from the explanans. To answer the question *why explanadum x?*, reference is made to the set of explanans. The relationship of the components of the explanans must be logically consistent or *closed* as must also be the relationship between the explanans and the explanandum.

For instance, consider the following observed phenomenon: steam is rising from the kettle. To answer the question "why is there *steam rising from the kettle*? (the explanandum is in italics), the following explanans is offered:

a) initial condition 1: there is water in the kettle,
b) initial condition 2: a thermometer plunged into the water indicates the temperature is 100°C,
c) general law: water boils at 100°C and transforms into steam.

The covering law model is applicable in both explaining observed phenomena (postdiction) and unobserved phenomena (prediction). This gives it its symmetry property. Regardless of the nature of the phenomena, the explanans must have empirical content, i.e. be empirically tested and verified, and must be true. Otherwise, the relaxing of the strong condition of truth in the explanans changes the explanandum to the status of a *potential* explanation. Therefore, the search for the constant conjunction of events

[6] It is also recognized as the hypothetico-deductive model, the Hempel-Popper model, the Hempel-

serves as the means to give statements empirical content.

A variation of the covering law model which is familiar in economics is the inductive-probabilistic model (I-P). Here, the relationship between the events contained in the explanans is probabilistic (the probability of event T given initial conditions U is q, $0 < q < 1$) and the relationship between the explanans and explanandum is inductive. Furthermore, the explanans premises contain a general probability law *P (event T given conditions U) = q* and an initial condition statement *there are particular conditions of type U*. Therefore, the explanandum *there is a particular event of type T* is inductively inferred from the explanans. The power of the inference is the probability statistic q.

This is a model of the conduct of scientific explanation. Through it, the method of developing the explanans and the explanandum (*the context of discovery*) does not matter so much as the logical consistency and empirical verification of the scientific explanation of an event (*the context of justification*). Popper offered one additional prescription to this model: falsification. Scientists should strive to refute their stated hypotheses, their explananda, rather than try to verify them. According to Popper, a hypothesis that survives repeated tests is a robust hypothesis, and may be considered true until proven false, according to Popper (Miller 1999: 722).

2.2 Empirical realist-grounded explanation in orthodox economics.

In the official Methodology of mainstream economics or what maybe called its *received vi*ew, the covering law model is prescribed. It is the official Methodology in

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Oppenheim model and the subsumptive theory of explanation (Niiniluoto 1999: 190).

that it is what is generally said to be the method followed[7]. However, observers of the practices of economists find that such a prescriptive method is "so demanding that little of economics would survive if it were rigorously applied" (Caldwell 1982 paraphrased in Blaug 1992: xiii). Instead, economists tend to practice *confirmationism* which is the amassing of empirical evidence, in particular the data of successful predictions, which corroborate their hypotheses and theories. In other words, they practice a sophisticated verificationism. Blaug, noted commentator on economic methodology and staunch Popperian, criticizes this practice and urges economists to try harder in their efforts to falsify economic theories, i.e. prove that they are false (Blaug 1992: xv).

So, we are presented with the official Methodology that may be printed on the back of a business card. The fate of the whole effort (the context of discovery) hinges on what happens in the context of justification where the attention is on two-stage procedure. Stage 1: form an observable implication of your higher-order hypothesis. Stage 2: test it (McCloskey 1994: 9). The outcome will mean either be a successful conclusion or a return to the drawing board.

There are two variations of this method that are said to characterize mainstream economics research. They are named here as pure *theory* and *instrumental positivism.* Philosophically, pure theory is a foundationalist project, finding its method in the work of Euclid and Descartes (Hoppe 1992: 367-368). Theory is constructed with some basic, self-evident axioms (or primitive statements) from which all further propositions are deductively deduced. The structure of knowledge is a linear, hierarchal chain formation, closed logically and mathematically. In the introduction to his influential *Three Essays*

[7] Official (large case) Methodology and unofficial (small case) methodology are terms used by McCloskey to distinguish what is said to be done and what is actually done in economics research (McCloskey 1994:

on the State of Economic Science, Koopmans declares that a feature of the book is an "emphasis on explicit formal model construction both in theory and in empirical research" which is fundamental in "the task of providing him (the policy maker) over time with better, more explicit and more transferable knowledge" (1957: viii-ix). This distinguishes the pure theory project from the rest of the economics discipline. Despite its avoidance of empirical verification, pure theory has become the most influential sub-discipline in mainstream economics. Its method differs from the conventional covering law model of explanation in that the propositions are not often empirically tested. They must be demonstrated to be logically possible but it is not necessary that they are empirically verified.

Another variation of official Methodology in economics is instrumental positivism[8], an approach advocated by Friedman (1953). Instrumental positivism does require empirical tests of its theories. Friedman remarks that a hypothesis "is to be judged by its predictive power for the class of phenomena which it is intended to explain" (p. 8). The assumptions which support the hypothesis, the premises within the explanans, do not have to be realistic, as long as they are "good approximations for the purpose in hand" (p. 15). Although the assumptions are not as rigorously deduced as in the "pure theory" project, logical consistency and closure is maintained and constant event conjunctions are sought to confirm the predictions.

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xi).

[8] Although they share some common concepts, instrumental positivism should not be confused with ewey's pragmatic instrumentalism (Bush 1994: 894-97).

2.3 Problems in orthodox economics.

What is the problem then? Progress in economic knowledge is felt to be lacking and the reason for this is believed to be methodological. Despite its positivist pretensions, mainstream economics fails to predict events successfully and it does not adequately explain economic phenomena of interest. This is Lawson's point of departure in his argument for a critical realist economics. Citing the claims of both popular media commentators and prominent economists themselves, Lawson suggests that these signs of crisis which may be understood in terms of theory/practice inconsistencies. More specifically, he sees inconsistency at three levels: at the level of method where economists do not practice what they preach, at the level of social theory where restricted conceptions of choice do not permit real choice at all, and at the level of methodological discourse where economists who oppose such discussion inevitably find themselves involved in it (Lawson 1997: 3-14).

Lawson's critical position toward the empirical realist conception of science which grounds the official Methodology of mainstream economics is supported by his citations of negative evidence that indicts the orthodox program. Yet, the views of two critical observers who adhere to Popperian prescriptions also find the discipline to be wanting. Backhouse's definition of progress in knowledge is our ability to say more scientifically significant things about the world. For there to be progress in economics knowledge, the discipline must be empirically-based. Hypotheses must be falsifiable. However, despite innovations in computing and econometrics, he finds not much empirical progress to date (Backhouse 1997: 136 cited in Caldwell 1998: 1524).

Blaug also assesses the state of the discipline in terms of theoretical and empirical

progress. He argues that falsification is practiced in the discipline and this may be seen in the history of microeconomic and macroeconomic thought in the last 100 years. However, his examples of macroeconomic hypotheses that have not survived empirical tests of refutation suggest that the sphere of macroeconomic theory is filled more with contentious conjecture than novel fact. For example, the Keynesian consumption function, the Phillips curve, the monetarist hypothesis of a stable velocity of money and the New Classical policy-ineffectiveness proposition have all been empirically refuted (Blaug 1992: xv). Microeconomic theory, the area in which Blaug and Backhouse see most of 20th century theoretical progress, is charged with being more descriptive than predictive in nature, raising the question whether theory provides an interpretive understanding rather than causal explanation. Blaug defends microeconomic theory up to a point. It does make predictions that can be falsified (e.g. demand curves are downward-sloping) and there has been an accumulation of empirical evidence that has informed theoretical development. However, as with macroeconomics, some of this evidence refutes key hypotheses within the neoclassical body of theory (e.g. the expected utility model, job search theory, marginal productivity theory of wages, neutrality of money), eroding the empirical basis of a unified, coherent neoclassical microeconomics (Blaug 1994: 122-129).

On a further note, two research programs that have generated much disciplinary work in the last 50 years do not escape Blaug's critical gaze. General equilibrium theory "has no empirical content and never will have any empirical content", providing only a "benchmark with which to evaluate other hypothetical models of the economy" (p.124). While useful in providing theoretical tools, he believes the pursuit of form over content

has made such work to be irrelevant. Game theory has not yet lived up to its promise. Although it has re-conceptualized some subdisciplines (e.g. industrial organization), it suffers from the same formalistic excesses as general equilibrium. It has not provided any new testable hypotheses in industrial organization and it has not produced a single novel fact (p.129).

Among the many explanations for this malaise of the mainstream, critical realism is the one examined here. Lawson points to the empirical realist conceptions that underpin the orthodox project. Recall that the empirical realist position claims that knowledge of real relationships between objects can only be through observation of phenomena on the surface of objects in the form of constant event conjunctions. The pursuit of constant event conjunctions to elaborate knowledge claims in the form of scientific testable hypotheses is misguided. The problem, according to critical realism, is that event conjunctions are very rare in both natural and social reality. While the covering law model of scientific knowledge does appear to provide a very applicable method in separating science from non-science and sorting corroborated from refuted theories, this model does not seem to account for what some economists actually profess to be decisive in the development of knowledge. Summers remarks that:

> the only empirical work that has contributed to thinking about substantive issues and the development of economics is pragmatic empirical work, based on methodological principles directly opposed to those that have become fashionable in recent years (Summers 1991: 129).

And as for the use of empirical evidence, Friedman plainly states "the role of statistics is not to discover truth. The role of statistics is to resolve disagreements among people" (quoted in Hammond 1990: 167 cited in McCloskey 1994: 4). With mainstream

economics appearing inconsistent at the level of method and lacking in explanatory progress, critical realism offers its alternative position.

2.4 Critical realism: its ontological and epistemological position.

Critical realism provides a descriptive model of scientific practice that is potentially more fruitful. Let's explore its ontological and epistemological foundations. As with empirical realism, the critical realist ontological position features a commitment to recognizing an external reality independent of the mind. Yet critical realism makes a claim about the nature of this external reality. In addition to the domain of actuality where surface events are observed to happen, a third unobservable domain is proposed. Bhaskar calls this the real or deep domain. It is inhabited by structures, mechanisms, powers and tendencies. It is these objects in the deep domain that govern the events in the actual domain that we perceive in the empirical domain. Unlike empirical realism, critical realism supposes that these different levels of reality are out of phase with one another. There are structures and mechanisms in the real domain that may interact and counteract with one another. In different situations, some of these objects are active while others may be inactive. The activity in the real domain is complex. The phenomena in one domain cannot be reduced to the phenomena in another domain. These objects in the real domain are intransitive and structured and exist independent of their discovery. There exist causal relations between these transcendental objects.

While the empirical realist position argues that it is not possible to know anything about these *deep* real objects that are responsible for generating the phenomena we observe, critical realism proposes that it is possible. Bhaskar refers to the philosophy of

Immanuel Kant (Collier 1998: 720). In his search for a solution to both rationalism's inability to demonstrate existence and empiricism's inability to demonstrate how experience becomes knowledge, Kant found inspiration in Enlightenment-era natural scientists like Newton. How do scientists successfully come to know certain real mechanisms like gravitational forces? They start with empirical data, they analyze it and they make a judgment as to what they believe is the general nature characterizing the data. This method represents the dual nature of knowledge acquisition. By drawing on the innate concepts hardwired in our cognitive architecture (concepts such as space, time, quantity, quality relation and modality), we can process the experiential data we acquire and form conceptions of it. The cognitive architecture structures the way we make inferences about reality. Meaningful synthetic a priori statements (which are scientific explanations) are possible (Osborne 1992: 101-104).

Bhaskar adopts this Kantian ontological-epistemological position and develops his general theory of the sciences labeled *transcendental realism*. He argues that the world, both natural and social, is characterized by open systems. How natural scientists are able to uncover the deep mechanisms that operate in nature and indeed generate the phenomena we observe is primarily through controlled experiments. Observations of naturally occurring events are not reliable. Rather, an artificial test situation where the system is closed must be engineered. A closed system is one where the mechanism of interest is isolated from other possible mechanisms. The mechanism is triggered and made active, creating events that confirm the existence of the mechanism under investigation. In the experimental situation, the investigator searches for observations that correspond with the action (triggered from outside the experimental space) and the

resulting reaction. However, in the uncontrolled open system outside of the experimental space, such constant event conjunctions are rare, suggesting a cacophony of active mechanisms. Consider the number of different active mechanisms that explain the trajectory of a plastic bag blowing in the wind. Gravity is not only at work.

This does not undermine the possibility of a social science where we can come to know the deep mechanisms and structures that generate observable social phenomena. Although the controlled experimental moment is not feasible in the social sciences, the deeper objects can be revealed. This is demonstrated by those natural scientists who work in non-experimental open systems (e.g. geologists, natural historians, meteorologists). The Bhaskarian reconstruction of scientific practice involves a restatement of the aim of science: *to uncover the real unobserved objects of deep domain.*

2.5 Critical realism: transcendental realism in the social domain.

The controversies over the difference between social reality and natural reality, the epistemic status of knowledge of either reality and the appropriate method of inquiry[9] is transcended by the critical realist position which in part comprises the transcendental realist theory of science. The critical realist account of social reality allows for a naturalism within social science. The social theory that is embedded within critical realism is as follows. Social phenomena are dependent on human agency, which in turn features the freedom of choice. Therefore, it is possible that an observed social event could have been different had different choices been made by agents. Social reality is an

[9] One example is the Verstehen doctrine which holds that "social science must be grounded in first-person knowledge that is intelligible to us as human beings, and not third-person knowledge corresponding to the measured outcomes of a laboratory experiment" (Blaug 1992: 251). The leading proponent of this doctrine

inherently open system in its possibility of change. Although this may suggest that social phenomena are observed to be in a state of chaotic random flux, Lawson argues that there are some mechanisms that come to dominate others over restricted regions of time and space. People reproduce mechanisms that cause social events, thus the existence of culture. The exercise of reproduction may be conscious or unconscious. The reproduction of activated social mechanisms allow us to observe event patterns in social reality: for example, the tendency for quantity demanded to fall as price rises, the preponderance of women employed in the tertiary sector, the tendency of formerly colonized Southern economies to export primary commodities. If partial event regularities can be observed, this maybe helpful in making some rough generalities that explain the observed pattern (Lawson 1994: 276).

Humans also demonstrate the ability to transform deeper mechanisms that animate social life. The important role of knowledge is more apparent here. The social production of knowledge conditions the ability of people to transform intentionally social structures. Yet the transitive, contextual and asymmetrical nature of knowledge within society constrains the transformative capacity of people. The conception of human agency in critical realism is akin to Marx's aphorism:

> Men make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly found, given and transmitted from the past (Marx 1852: 595).

The social theory embedded in critical realism has not been without critics who point to CR's relatively narrow conception of human thought and action in the social context (Baert 1996). This criticism is well-placed and critical realism as applied to the

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is Friedrich Hayek who sees the pursuit of economic knowledge using methodological principles from the

social sciences will likely be strengthened through engagement in the social theory discourse. It is not apparent that the critique on the grounds of social theory weakens the critical realist project in economics. After all, any social theory which broadens the conception of human agency beyond the atomistic rational optimizer equipped with perfect information is a step in the direction of realism.

2.6 Critical realism and procedure of inquiry in economics.

Lawson's procedural outline for critical realist-grounded economic inquiry is a reconstruction of actual scientific practice that he believes invites explanatory success. The procedure may appear as common sense and similar to that practiced by investigators adhering to an ER view. However, there are key aspects that distinguish it from the more narrowly-defined covering law model of scientific explanation (*the received view*). In particular, the role of demi-regs in initiating inquiry, retroductive inference and the realism of the hypothesis are distinctive features. Making such procedural distinctions explicit assist in identifying the perceived weaknesses of particular methods grounded on an empirical realist ontology, namely, some mainstream econometric and pure theory methods.

In the following, the CR-grounded scientific method practice is described. First, the procedure for *pure*, *abstract* or *theoretical* inquiry is outlined where the aim is to identify stable, enduring mechanisms which produce observable partial event regularity. This is followed by a description of applied CR-grounded inquiry. *Applied*, *concrete* or *practical* inquiry is the complement of pure inquiry where the objective is to explain an observed unique or novel phenomenon in terms of the conjoint activity of several

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natural sciences as prejudiced and unscientific (Ekelund and Hébert 1990: 561-562).

previously identified mechanisms. The discussion concludes with a note on the use of abstractions and the epistemic status of CR-grounded explanations.

2.7 Method of Pure Explanation

Stage 1. The roots of inquiry: observing demi-regs.

What initiates scientific investigation? There are several answers for this, from a natural human curiosity about how things work to a survival instinct that impels us to seek understanding in order to control things not naturally within our control. The American pragmatist Dewey would say that inquiry originates in doubt that is triggered when one's cognitive explanatory template interfaces with real experience (Bush 1999: 895). Incongruence between the experience and one's habitual mode of thought creates cognitive dissonance or doubt. This is consistent with CR. Lawson sees the detection of contrasts in empirical data as initiator of inquiry.

In an open, dynamic world (both natural and social), the appearance of events in the actual domain can be categorized on a frequency continuum, from constant regularity (the rising of the sun) to random non-regularity (the shape of snow flakes). Events may be single and unique and only happen once or they may happen repeatedly. Observation of event repetition or partial event regularity allows us to infer that there is some active mechanism responsible for this observed pattern. By partial regularities, Lawson refers to events observed over restricted regions of time and space that are generated by mechanisms that come to dominate others and/or shine through the chaotic calamity of simultaneous events. The activity of these mechanisms causes events which we observe in a pattern. Partial event regularities are also termed demi-regularities (demi-regs) or

stylized facts[10].

The existence of demi-regs in the social world allows the possibility of scientific inquiry and explanation. Therefore, the lack of the contrived closed experimental situation does not limit the project. The search for demi-regs is naturally backward looking. Social science is an historical or retroactive science. Identifying partial event regularities can spark inquisitiveness. Detecting contrasting demi-regs are even more helpful in that suggest that there is a causal factor(s) whose effects are creating a difference between the two groups of demi-regs. The investigator may pose the question: what enduring mechanism is likely responsible for the contrast? An example of a contrastive demi-reg is that the majority of Canadians live in the south near the U.S. border while the American population is more evenly distributed across the country. What possible deeper mechanisms would explain this?

Stage 2. Forming an explanative hypothesis: the retroductive inference.

In the process of coming to understand the reasons that explain the stylized facts, the investigator seeks a hypothesis (a statement or a set of statements) which identifies a mechanism which if it existed would account for the observed stylized facts. The investigator would draw upon antecedent knowledge (and this includes theories, facts, intuitions, guesses, hunches) to posit a hypothesis. In the above case of Canada's population distribution across the country, I could offer the following possible explanations: climate, historic trade linkages with the United States, the location decisions of railway construction, the southern location of the St. Lawrence-Great Lakes

[10] "Stylized fact" is a term coined by Nicholas Kaldor. He implies not "that any of these 'facts' are invariably true in every conceivable instance but that they are true in the broad majority of observed cases – in a sufficient number of cases for an explanation that would account for them" (Kaldor 1985: 9). Cited in Lawson 1997: 208.

water system. These supposed reasons could all contribute to the observed distribution pattern. One factor may pre-dominate among the hypothesized mechanisms, e.g. historic trade linkages. Countervailing structures may exist which may explain contrasting observations. For example, settlement may be influenced by the economic opportunity offered by petroleum deposits. This is a supposed explanation for the observation known as Edmonton, Alberta. This illustration shows the use of antecedent knowledge when developing hypotheses.

When investigators look to the unobservable deep domain of the causal mechanisms, they must draw upon antecedent knowledge once again. This time, an analogy or metaphor is posited. An analogous mechanism is supposed because we infer that the "if it existed and acted in the postulated manner, (it) could account for the phenomenon singled out for explanation" (Lawson 1997: 212). This mode of inference is retroductive or abductive.[11] It is the use of the familiar to come to know the unfamiliar. For example, in seeking a causal mechanism to explain how people spend their wealth for present utility and for future utility, Gary Becker used an analogy from neoclassical capital theory. The resulting explanation became known as "human capital theory" (Becker 1964 cited in McCloskey 1995: 219-220). The inference involves movement from the surface phenomenon, in this case, observations of consumer expenditure on health, education, training, migration, etc. to a deeper unobserved causal mechanism, in this case, a behavioral imperative guiding present and future consumption plans.

[11] Abduction: a syllogism in which the major premise is evident but the minor premise and therefore the conclusion is probable (Webster's Third International Dictionary of the English Language Unabridged. Springfield, Mass: Merriam-Webster Inc., 1986).

Stage 3. Assessing the Causal Hypothesis.

After the causal hypothesis has been identified, its explanatory power must be assessed. In the absence of the experimental test situation, the hypothesis must be assessed on the basis of *explanatory power*: its ability to explain a wide range of phenomena. There are 3 phases in this assessment.

Step 3A. Deduction.

The effects of the retroduced hypothetical mechanism are deduced. We state that these effects would be the consequent of the mechanism, if operating.

Step 3B. Empirical Verification of the Deduced Effects.

The deduced effects are compared with empirical evidence. There is the possibility that the evidence will not corroborate the deduced effects. This may be interpreted in two ways: 1) the hypothesized mechanism is incorrect; 2) there are countervailing mechanisms which are active thereby making the deduced events unclear or not visible.

Step 3C. Explaining the Explanation.

This part involves identifying the conditions or assumptions of the explanative hypothesis and empirically verifying their activity upon which the mechanism activity is contingent.

Parts 3A and 3B will appear to the reader as similar to the two-stage procedure in the covering law model. There is deduction and verification as featured in the deductive-nomological model. The key difference is that the hypothesized explanation does not require a universal law among its premises. What is necessary is a statement of

antecedent conditions, which if active, would allow the activity of the hypothesized mechanism. The activity status of these antecedent conditions is examined. This could involve further deduction and empirical verification as the conditions themselves maybe unobserved mechanisms of the deeper domain. This procedure contrasts with the *irrelevance of assumptions* thesis of Friedman's instrumental positivism method where the realism of the assumptions does not interfere with the epistemic status of the hypothesis. If the aim of science is to identify the mechanism responsible for the observed phenomena, then the realness of the mechanism must be checked.

Stage 4. Assessing the explanatory power of the hypothesis.

Step 4A. Response to verification failure.

This moment in the research project where hypotheses are assessed is rather crucial. In the empirical realist-informed procedure, a hypothesis for which empirical evidence does not corroborate the deduced effects would perhaps be rejected. The ER approach seeks *absolute* explanations that transcend the time-space context. Underpinning this procedure is some abstract a priori formula that states the precise conditions under which a hypothesis may or may not be accepted. An example would be the decision rules used in statistical tests. Such Popperian formulations display a logical elegance, yet it has been previously argued that practicing economists do not strictly follow them (Caldwell 1982).

In CR, this narrow course is felt to be both unproductive and unnecessary. In the CR approach, assessing the *relative* explanatory performance of hypotheses is emphasized. This framework recognizes that empirical evidence is contextual. It also holds that a mechanism's activity (or inactivity) is also context-dependent. Therefore, verification

failure does not necessarily deny the existence of the hypothesized mechanism. It suggests that it is possible that the hypothesized mechanism is inactive or that its effects are distorted by other countervailing mechanisms. The hypothesis should remain in the investigator's notebook of hypotheses. To illustrate, consider five moments in the Canadian economy which feature a downturn in the business cycle: 1912, 1929, 1957, 1974, and 1982 (Norrie and Owram 1991). Given the contextual uniqueness of each historical period, it would be improbable that the exact identical mechanism (or set of mechanisms) was activated in each of these five downturns. There may have been some active mechanisms common in each situation, but this not does validate the exclusion of factors unique to each event in explaining a particular. The experience of 1970s stagflation (high unemployment with inflation) demonstrates the point that mechanisms can become active in particular historic circumstances where otherwise they were inactive.

Step 4B. Discriminating between competing hypotheses.

The investigator should search for the hypothesis whose consequential effects are observed with a high degree of probability and explain the widest range of phenomena of interest. This hypothesis may encompass and subsume other competing hypotheses which explain the same phenomena[12]. This raises the issue of competing hypotheses and how to discriminate between them. Lawson gives the following strategy:

> Continue to search for conditions for which the competing hypotheses bear different implications with regard to empirical phenomena and ... check out which hypotheses proves to be the most empirically adequate to those conditions (1997: 215).

In the case where there are two hypotheses which have the same level of empirical

adequacy, the investigator must give each the same degree of belief or suspend judgment. This is the proper epistemic attitude to be had[13].

When the judgment process results gives a particular hypothesized mechanism the status of having relatively successful explanatory power, the rigorous investigator should continue to assess this single hypothesis and examine the range of observed events it explains, beyond the range of events which led to the hypothesized mechanism's identification. In the ER lexicon, this suggests testing the model using data outside the sample. This sense is essentially the same for the CR-grounded procedure although the CR discourse would emphasize the contextual nature of new phenomena which arise during the passage of historical time. CR rejects the ahistorical treatment of data in the ER-grounded framework.

2.8 Method of Applied Explanation

Whereas the aim of pure explanation is to identify the deep mechanisms and structures that are relatively stable and enduring, applied explanation seeks to explain the concrete observed phenomenon. Using the business cycle example, pure explanative inquiry would seek to identify all the mechanisms that underlie economic downturns. Applied explanative investigation seeks to re-describe a particular downturn, for example, the 1982 recession, in terms of its components. In re-description, the investigator again draws upon antecedent knowledge, similar to the procedure in Stage 2 above. This knowledge includes previously developed pure explanations. Underlying

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[12] This is similar to Hendry's approach to model specification in econometrics. It is also known as the LSE approach (Gujarati 1995: 485-6).

[13] Although Lawson does state that there "maybe many pragmatic reasons for preferring one theory", he does not expand upon this further (Lawson 1997: 321).

this method is the belief that the event of interest is the product of the joint activity of several mechanisms. The re-description of the event in terms of these deep mechanisms leads to a hypothesis which can then be subject to empirical verification.

2.9 Note on the Use of Abstraction

In both pure and applied explanative procedures, the cognitive act of abstraction is used throughout, especially in Stage 1 when the investigator searches for demi-regularities. The simple act of identifying contrasting patterns involves abstraction, where one looks at the phenomenon in a one-sided way. Some aspect of the phenomenon is brought into focus while other aspects are momentarily out of view. This is a necessary act without which the discernment of difference could be impossible.However, Lawson advocates that the investigator act self-consciously and recognize that one's vantage point is interest-laden and highly relative. This influences the selection of the phenomenon to be researched, the choice of hypothesized causal factors, etc. Also, the selection of the level of generality and the scope of abstraction should reflect the nature of the hypothesized mechanism. In the pursuit of identifying what is essential, some aspects of the phenomenon under investigation will go out-of-focus. But being out-of-focus does not mean that it can be assumed away. This is a distinguishing feature of the CR-grounded prescription. What is out-of-focus remains related to the phenomenon of interest. Pretending that it does not exist offers misunderstanding and misrepresentation. As an analogy, focusing on the sounds coming from the 2nd violin in an orchestra while blocking out the sounds made by all other musicians will not give one a sense of how the symphonic piece sounds. To avoid the atomistic/isolating fallacy which may lead one to be unable to tell the forest from the trees, skillful abstraction is required. The investigator

should act as competent video cameraperson, continually moving in for close-ups and reversing to get wider angle shots, sweeping pan shots to put the object in context and occasionally turning the camera on himself (i.e. mode of self-reflexive contemplation).

2.10 Epistemic Status of CR-grounded Explanations

In the critical realist framework, it is held that truth is possible. CR's commitment to both the ontological position of intransitive real objects and the epistemological position that our knowledge is transitive allows a consistent argument for the possibility of known truth. Transitive knowledge suggests that knowledge is fallible and historically relative. Explanative statements are expressive-referential. The referent, the object under study, exists independent of our knowledge. Yet we can only come to know this referent through expressions of the referent through our language. An explanative statement contains a truth claim (e.g. I am a cat. The real wage is the marginal product of labor.) which may be false. In this case, the truth claim is an inadequate expression of the referent. Yet the statement also functions to designate the referent; it recognizes the possibility of the referent's existence by containing it in language. Thus, we can enjoy the irony of the atheist's claim *there is no God.* Although expressive-referential statements may be fallible, this does not exclude the possibility that they may be improvable. Here one sees the critical aspect of scientific practice. Doubt of the claimed truth of a theory is the initial step in the critical inquiry undertaken by the investigator. Why did the phenomenon of interest unfold like this when our current explanative theory of phenomena of this type suggests something different? Critique of the existing theory may lead to the retroductive inferences of new hypotheses.

Recognizing that knowledge is transitive does not necessitate that all theories have claim to equal explanatory power. Judgment criteria of truth that are created and held by the scientific community provide the basis for the discrimination and selection of theories. Of course, the vantage point of the members of the community unavoidably taints the criteria. Yet, if the CR-grounded framework with its realist ontology framework maintains its critical posture towards developed explanations which express intransitive real objects, then the judgment criteria will also have a rational, discriminating side. As an example, suppose a CR-informed cartography department is responsible for drawing maps of downtown Tokyo. Critically rational cartographers will recognize that they cannot create the perfect map. Maps, being expressions of an external reality such as downtown Tokyo, are fallible in that they can contain mistakes. In a particular edition, a few streets were missed or a cul-de-sac was drawn which did not exist. The map can be improved and revised, bringing it closer in likeness to the referent. Remember that maps are abstractions. Certain aspects of downtown Tokyo are brought into focus, for example streets, leaving other things out of focus. Another map could be drawn which expresses only buildings, green spaces or underground subway lines.

What is the status of explanative statements, like our Tokyo map, when they are found to be inadequate? They are not rejected as sheer error and disposed. Since they are *previous successes* situated in historical context, it is valuable to maintain awareness of their situatedness, their conditions of acceptance and successes. Not only is this useful in a history of thought tool kit, but such previously successful explanations appear to be valuable in a pedagogical sense. Both Newtonian physics and Marshallian partial

equilibrium analysis have been subsumed by other explanations with claims of greater adequacy (Einstein's theory of relativity and Walras's general equilibrium analysis). Yet both of the former theories are still taught to students. Why? They still explain a lot.

In summary, our knowledge of the transcendental objects of the deep domain is transitive. Present knowledge, not only our scientific explanations but facts, observations, intuitions, guesses, all these condition further knowledge that is actively transformed through the social practice of science. In an evolutionary sense, "science proceeds via a continuing spiral of discovery" (Lawson 1997: 25).

2.11 Orthodox Method and Theory: fault in method and weakness in explanation.

A critical realist economics pursues scientific knowledge without the strictures of the empirical realist-based official Methodology. In CR, theories found to be relatively inadequate are not rejected and abandoned as sheer error. However, CR does criticize the development of theories and the practice of methods that it sees as having being embedded in the empirical realist framework. The differences in ontological conceptions between critical realism and empirical realism reflect in the differences in the methodological procedure and epistemic position. As described earlier, the aim of science under the ER framework is to discover constant event conjunctions that verify explanative statements of relations between objects. The statements are of a law or law-like form featuring universal applicability. In order to develop explanations that ensure constancy of relations in both postdictive and predictive explanations, an investigator must seek *closures*. Successful closed statements are stable over time/space and are recoverable. Here, recoverable means that for the given observed event, the premises or

explanans can be recovered from the hypothesis or explanadum that explains the event. There is a one-to-one correspondence.

Lawson identifies three devices that ER-guided investigators pursue to achieve closure:

1) Extrinsic closure: Variables believed to be causally necessary to the phenomenon of interest are isolated from other "non-consequential" variables. These variables are assumed to be constant or orthogonal (non-influential) to the variables of interest.

2) Intrinsic closure: This is an abstracting process where an essential aspect of the structure within the variable of interest is identified and closed from non-essential features. The essential structure would be something that is common to all members of this variable category. In orthodox economics, a common intrinsic closure is the characterization of all individuals as rational optimizers.

3) Aggregative closure. In supposing that the whole is the summation of its parts, populations are assumed to be homogenous and can be reduced to its constituent members. It also proposes that there is relational independence between members. Therefore, any configuration of relations between members (seen through such categories as gender, class, and kinship) are assumed not to inhibit stable aggregation and recoverable disaggregation. Successful aggregative closure depends on successful extrinsic and intrinsic closure. Everyone is a rational optimizer. It is one characteristic that everyone shares. Other characteristics are non-consequential in the final tally. This device is a key assumption underlying the microfoundations project in macroeconomics.

These closure devices may be observed in the practices of economists, particularly in the orthodoxy, but not limited to it. Two examples that come under

criticism are certain econometric practices and the pure theory program. In econometrics, the search for econometric models of variable relations that exhibit universal stochastic regularity has been frustrated by inevitable model breakdowns. Estimated parameters that were once thought to display robustness later collapse. The commitment to a social ontology that presumes an ergodic closed system perpetuates this search for robust empirical models which mirror this perceived closed system. A response to model failure is to pursue further extrinsic and intrinsic closure. Further extrinsic closure could mean further isolating variables of interest from others, reducing the number of explanatory variable included in the equation. Or it could mean including more variables, endogenizing variables previously assumed to be exogenous. The latter may appear fruitful in a critical realist framework. Yet once additional variables are introduced into the model, they may be subject to further abstraction or essentialization to achieve intrinsic closure. However, the impossibility of including all relevant variables in their appropriate generalized form in a structural relationship that somehow responds to both constancy and variability will inevitably result in predictive failure. Continued pursuit may be as fruitful as a project to build a perpetual motion machine. As one outside observer comments, "econometrics sprouted from the same intellectual roots as weather forecasting – rarely accurate but devoid of memory, thus cheerful about being wrong" (Saul 1995: 113).

The pure theory project, with its axiomatic-deductive method, also seeks to achieve deterministic regularity. In this project, hypotheses are not often confronted with data and thus do not needed to be empirically verified. Instead, the deductively-derived hypotheses must meet the rigors of mathematical proof such as the demonstration of

reducibility and recoverability.

To illustrate, consider the following proposition: for event y, there are variables of type x arranged in functional form F. Whenever there are factors x arranged in functional form F, there is event y. Expressed algebraically, we have the following:

$$\forall\, y, \quad \exists\, x_i = (x_1, x_2 \ldots x_n) \text{ s.t. } F(x_i) = y \text{ and}$$

$$\forall\, x_i = (x_1, x_2 \ldots x_n) \text{ s.t. } F(x_i)\,, \quad \exists\, y\,.$$

The event y can be deduced from the variables x and the variables x can be deduced from y. Explanative theories of this form imply a correspondence theory of truth where there are relations of correspondence between the language of the argument and the real object it represents.

When deterministic regularity of the hypothesis cannot be demonstrated mathematically, the devices invoked by the theorist are the same as those used by the closed-system econometrician: extrinsic, intrinsic and aggregative closure. The requirement of extrinsic closure will force the theorist to either isolate variables from the explanatory set or endogenize them. To achieve intrinsic closure, the variable will again be further abstracted to insure intrinsic constancy and uniformity. This progressively atomizes the variable. In the case of the human subject, one is reduced to a passive monad, devoid of agency. Whole economic systems can be re-described as constellations of hedonistic molecules. It is no wonder that the pure theory project is increasingly regarded with contempt: "most of the lemmas of rigorous pure theory do not satisfy the desire to understand how things hang together in the economic world" (Blaug 1992: xxii).

Such practices in econometrics and pure theory illustrated here demonstrate two fallacies which characterize ER-grounded economic inquiry: isolationism and atomism.

Dogmatic deductivism taken to the logical extreme will result in "systems so large that they exclude nothing, couched in terms of individuals so small that they include nothing" (Lawson 1997: 84).

A critical realist economics does not endorse such methods. Its ontological commitment to an intransitive unobservable domain (which in turn informs its epistemic position of fallible, transitive knowledge) precludes truth claims grounded on a closed system actualist ontology. Of course, this does not suggest that the contents of theories developed through an empiricist realist framework should be ignored. On the contrary, such explanations constitute part of the antecedent knowledge held by economists who have been trained in the neoclassical-Keynesian synthesis that has dominated the economics curriculum in the post-war era. This antecedent knowledge set can be drawn upon in the investigator's search for retroductive inferences. Insight may be gained through examination of the properties of closed system models. However, treating such models on their own terms without any appropriate contextualization and recognition of their limits/deficiencies would seem to perpetuate the practices in ER-grounded economics which tend toward greater elaborations of a universe of empty individuals without any illumination of economic reality.

3 Critical Realism and Post-Keynesian Economics

Given this explanation of critical realism as a methodological framework, the relationship between critical realism and post-Keynesian economics will now be explored. The choice to assess post-Keynesian economics of its compatibility with critical realism is not an arbitrary decision. In fact, the following summary of events in both the critical realist and post-Keynesian discourses will illustrate the convergence of the two. In the first part of this section, the coherency debate will be examined. This will be done by tracing the historical development of the school. More specifically, specific writings in the "post-Keynesian literature" will be addressed. This leads into the second part which outlines the Lawson-Dow proposition of recognizing critical realism as the philosophical foundation of post-Keynesianism". At the end of the section, we will be prepared to consider the implications of a CR-grounded Post-Keynesian economics.

3.1 The Coherency Debate

The "coherence of post-Keynesian economics" debate which emerged in the literature in 1988[14] is a milestone in the history of the post-Keynesian school. In order to give context to this debate, the history will be briefly summarized.

3.1.1 The Post-Keynesian School, 1936-1988

As a body of economic thought, the post-Keynesian school began as informal conversation between John Maynard Keynes and his colleagues[15] at Cambridge during

[14] See Hamouda and Harcourt (1988), Backhouse (1988), Caldwell (1989).

[15] The so-called 'Cambridge circus' included R. Harrod, R. Hawtrey, R. Kahn, and J. Robinson. These figures are mentioned in the preface to the *General Theory*. P. Sraffa was also at Cambridge. Although Sraffa was a friend of Keynes, his involvement in the discussions around the *General Theory* is not certain. As J. Robinson recounts, "Sraffa had shown a draft (of *Production of Commodities by Means of Commodities*) to Keynes in 1928. Keynes evidently did not make much of it and Sraffa, in turn, never made much of the *General Theory*" (1978: 14).

the 1930s while Keynes worked out the *General Theory* which was published in 1936. As a visionary, Keynes offered a new way to view the economy and society through a macroeconomic framework furnished with conceptual innovations such as the principle of effective demand. As a leader of an intellectual movement, he inspired a novel approach to economic thinking that was followed and extended by his colleagues. The post-Keynesian school is a legacy of Keynes' vision and leadership. While it is suggested here that the starting point in the school history is Keynes, two important points must be made. First, although Keynes maybe credited with initiating the intellectual movement which bears his name, it has been claimed that contemporary post-Keynesians cite pre-Keynesian classical thinkers such as Smith, Ricardo and Marx as sources of influence. It is not surprising that a feature of post-Keynesian writing examines and draws upon classical thinkers, the "exegesis of the ideas of long dead economists" (Dunn 2000: 343). Second, Michal Kalecki developed a macroeconomic framework with similar conceptual innovations as those developed by Keynes. Its 1933 publication predated the *General Theory* by two years and its inclusion of class relations and oligopolistic features have led some contemporary post Keynesians to claim that Kalecki went beyond Keynes in theoretical innovation and "provides better foundation for a post-Keynesian (...) research programme" (Lavoie 1992: 422). However, his contributions were relatively ignored as the discipline focused on the *General Theory*. Two exceptions were his disciple Joseph Steindl and his friend Joan Robinson. Only in the 1970s would Kalecki's thought begin to receive the consideration it warranted through the scholarship of such economists as Alfred Eichner and Athanasios Asimakopulos.

The interpretations of Keynes's *General Theory* and the subsequent controversies within the economics discipline propelled the conversation and initiated an intellectual movement. The interpretation of Keynes' macroeconomic framework in a general equilibrium framework such as Hicks' IS-LM framework (1937) began the "grand neo-classical synthesis" (Arestis 1992: ix), producing a "bastard Keynesianism" as Robinson phrased it. In belief that Keynes' intended message was in danger of disappearing amid the neoclassical interpretations, his colleagues, in particular Robinson, took a dissenting position. The 1950s saw the launch of the Cambridge capital controversies with Robinson's series of articles that questioned neoclassical capital theory, specifically the problems associated with measuring capital and thus the returns to capital (Robinson 1953-4). This implicated the neoclassical theory of value and distribution. Nicholas Kaldor, having arrived at Cambridge in 1947, publishes in 1957 his model of growth and distribution which featured the dual saving rates assumption (Kaldor 1957). The following decade began with the publication of Sraffa's *Production of Commodities by Means of Commodities* (1960). This would provide stronger theoretical foundations for critique of neoclassical capital theory. The debate pitted Robert Solow, author of the neoclassical growth model, and Paul Samuelson of Cambridge, USA against Robinson and Kaldor of Cambridge, UK who were joined by Luigi Pasinetti and Pierangelo Garegnani. Samuelson published a paper in 1962 "Parable and Realism in Capital Theory: the Surrogate Production Function" which sought to demonstrate that "unrealistic" abstract models of the neoclassical aggregate production function with substitution could be recovered in a more realistic 2-sector fixed-coefficient model with an infinite amount of different techniques (i.e. different combinations of capital goods).

Samuelson's student D. Levhari later proved in 1966 that reswitching was impossible when the technology matrix was in a generalized form. In a symposium on paradoxes in capital theory published in the *Quarterly Journal of Economics*, Pasinetti (1966) and Garegnani (1966) demonstrated that it was indeed possible for re-switching to take place, to which Samuelson agreed that the non-switching theorem was false (1966). The consequence of the conclusion of this debate was the demonstration that the theoretical foundation of neoclassical capital theory was not sound. This is considered the first effective critique of the grand neoclassical synthesis by post-Keynesians. The demonstration that a strict inverse relationship between the interest rate and demand for capital does not hold undermined the neoclassical theory of value, income distribution and growth.

Also in the 1960s, a movement began in the United States among scholars questioning the orthodox interpretation of Keynes' *General Theory*. Rather than going the route of capital theory, Sidney Weintraub and his student Paul Davidson re-examined Keynes' position on the determination of aggregate price level, specifically why there are inflationary tendencies in an economy operating at less-than-full capacity. This led to investigations into the role of money and finance.

The Atlantic divide separating the Cambridge establishment and the young American movement was bridged in the 1970s. The 1970s may be regarded as the decade of transformation where the US and UK dissident communities came together to form a school or paradigm. The decade was characterized by the accelerated development of social networks and institution-building. These two sociological factors would support the growth and publicizing of the burgeoning body of thought (Lee 2000).

The first international gathering of post Keynesian economists was in 1971 in New Orleans during the Allied Social Science Association conference. The meeting was organized by Eichner and was attended by Robinson as well as several dissident economists (for example, Davidson, Asimakopulos, Jan Kregel, Hyman Minsky, Edward Nell) who would play prominent roles in the growth of the school. In addition to being a social organizer, Eichner re-introduced the Kaleckian approach through his scholarship.

Several key events followed the New Orleans meeting. Davidson would publish *Money and the Real World* in 1972. In the December 1975 issue of the *Journal of Economic Literature*, Eichner and Kregel had published "An Essay on Post-Keynesian Theory: A Paradigm in Economics". The purpose of the article was to present to the larger economic discipline "a guide to the post- Keynesian literature" and to show "that post-Keynesian theory has the potential for becoming a comprehensive, positive alternative to the prevailing neo-classical paradigm" (p. 1294). Two academic journals oriented towards the post Keynesian school were established: the *Cambridge Journal of Economics* (1977) and the *Journal of Post Keynesian Economics* (1978). In 1979, Eichner edited *A Guide to Post-Keynesian Economics*, a collection of essays by economists who either identified themselves as post-Keynesian or were sympathetic to post-Keynesian ideas.

From its first meeting in 1971 through the 1980s, the post-Keynesian social network grew rapidly, in part due to the interest of economists from other heterodox schools such as the institutionalists, the Marxians and the social economists[16]. The increase in the number of economists engaged in the post-Keynesian discourse was

[16] See Lee (2000) for details about the growth of the post Keynesian social network in the United States.

accompanied by growth in publications on substantive theoretical topics. This led to three phenomena which characterize the 1980s experience in the post-Keynesian community. The first feature was the clash over method between different groups within the school. The Trieste Summer School attempted to bring scholars of Sraffian and Keynesian parentages together to construct a viable alternative to the neoclassical mainstream. Failing to find common ground, the summer school did not achieve its goal (Lavoie 1999b: 1095). The resulting rift is felt to have cast the post-Keynesian community in a "period of doubt and deep internal tensions", an anxiety over distinctiveness and coherence that continues today (Fontana and Gerrard 2002: 10).

However, the 1980s saw other attempts in exploring synthesis without the apparent negative fall-out. A symposium in 1981 at l'Université d'Ottawa titled "Keynes et Sraffa: Interrogations Récentes en Économie Post-Keynésienne" featured several prominent post-Keynesian scholars (e.g. Eichner, Chick, Asimakopulos) whose papers were later published in *L'Actualité Économique* (see Eichner 1982 and Henry 1982 among others). Books were published that offered syntheses of thought. Reynolds (1987) explored similarities found in Kaleckian and Keynesian thought while Eichner (1986) examined the links between the post-Keynesian and institutionalist schools.

These encounters between different approaches has meant that participants in the discourse must consider matters of method. This is the third feature of the 1980s: the beginning of the methodological turn in post-Keynesian thought (Dow 1985). Alongside substantive work on topics of common interest such as money, macrodynamics, and growth and distribution, methodological attention becomes more explicit in post-Keynesian writings.

3.1.2 From Criticism to Coherence? Hamouda and Harcourt, 1988

Despite the proliferation of surveys and interpretive reviews of the post-Keynesian literature in the 70s and 80s, along with conference sessions and published works on the topic, Hamouda and Harcourt perceived that the larger economics discipline was still unsure about what constituted post-Keynesian economics. In an effort to demonstrate that post-Keynesians were not only unified by their rejection of the neo-classical interpretation of Keynes' contributions but also by their intentions "to provide alternative approaches to economic analysis" (1988: 1), the authors identify and describe three strands of inquiry within the post-Keynesian school. They also identify some "outstanding individual figures, who defy classification within any one group or strand"[17]. Strand one is the "fundamentalist Keynesians" (King 1999: 882), led by Weintraub and Davidson. This strand places emphasis on uncertainty, expectations and the role of money in its articulation of a monetary production economy. It relies on Marshallian microfoundations as did Keynes when he developed the *General Theory*. The second is the Sraffian or neo-Ricardian strand which follows the classic surplus approach of Ricardo and Marx but in its modern form as resurrected by Sraffa. The project is to integrate the Keynesian principle of effective demand within long-period analysis. It rejects the Marshallian determination of prices through supply and demand; instead it follows the "prices of production" approach. Leaders of this strand include Pierangelo Garegnani and John Eatwell. The third is the Kaleckian strand which features early advocates Steindl and Robinson and later disciples Eichner and Asimakopolus. Again, the influence of Marx is present in this strand with its emphasis on social relations

(e.g. wage earners and entrepreneur-employers), firm behavior and industrial organization (e.g. mark-up pricing and imperfect competition) and technical conditions of production. The focus of inquiry is the realization of surplus at any moment in time. Therefore, relations between saving, investment, accumulation, effective demand and profitability are explored.

While there appears to be coherency within each strand, the authors find that there are fewer coherencies between strands. Efforts to develop a synthesis between the three strands is not recommended by the authors as they feel that it would be "a misplaced exercise, that to attempt to do so is vainly to search for what Robinson called 'only another box of tricks' to replace the 'complete theory' of mainstream economics which all strands reject" (Hamouda and Harcourt 1988: 32). This position of methodological pluralism may be interpreted that attempts at synthesis may be counter-productive in their mimicking of mainstream efforts to construct a grand universal theory, in effect becoming what post-Keynesians oppose. The crux of the argument is that there is not one particular method in studying all aspects of economies. The three strands "differ from one another, not least because they are concerned with different issues and often different levels of abstraction of analysis" (p. 32).

This article may be seen as the progenitor of the coherency debate which has been a focus of debate in contemporary post-Keynesian discourse. Hamouda and Harcourt advocate that synthesis between the strands not be pursued and that the post-Keynesian school continue pluralist methodology. Following the article by Hamouda and Harcourt,

[17] The outstanding figures identified are N. Kaldor for his methodological and conceptual contributions, J. Robinson, L. Pasinetti and R. Goodwin for their integrative work on growth and dynamics, and W. Godley

there have been several responses that addressed the coherency issue. One response is summarized here.

Backhouse (1988), who identifies himself as a neoclassical economist and a methodologist, responds in several ways. He defends various features of the neoclassical approach, claiming that the neo-classical economists in the 1970s and 1980s have displayed a methodological approach akin to the post-Keynesian 'horses for courses' approach. A reason why questions are approached as problems of constrained optimization is that this technique has a proven track record of successful predictions. Some neoclassical economists, Walras no less, have considered 'historical time' in some modeling. The use of 'logical time' in modeling is justified by the intended purpose of the modeling exercises such as those found in general equilibrium analysis. The usefulness in general equilibrium analysis is found in the provision of benchmarks. The formalism of the neoclassical method ensures that conceptual issues are explicitly clarified, "making it very clear just what can and cannot be said" (p. 37). Citing Robinson's growth models, Backhouse demonstrates how some prominent post Keynesian economists have preached one methodological morality while contradicting it practice. Keynes' reliance on Marshallian microfoundations weakens the charge against marginalist emasculation of the classical theory of value. Some of the key distinguishing concepts between the neoclassical school and the post-Keynesian school, such as the difference between prices as indices of scarcity versus prices as indices of underlying conditions of production, do not seem so distinct.

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for his stock equilibrium approach (Hamouda and Harcourt 1988: 3).

Backhouse, peering through Lakatosian lens, sees the ad hoc nature of post-Keynesian theorizing from an incoherent body of thought as a symptom of a degenerating research program. While the post-Keynesian school may be regarded as a critical movement within the discipline, it is Backhouse's assessment that "they have not yet managed either (1) to provide a suitable alternative to the neoclassical research programme or (2) to show that the methodology underlying neoclassical economics is misconceived" (p. 40).

3.1.3 The Coherency Challenge: Arestis and Lavoie, 1992

In the wake of the Hamouda and Harcourt article, there have been several attempts to demonstrate coherency within post-Keynesian thought. Two attempts are considered here. In 1992, Lavoie's *Foundations of Post-Keynesian Economic Analysis* and Arestis's *The Post-Keynesian Approach to Economics* were published. Both attempt to demonstrate that a coherent body of substantive thought is possible. Their approaches do differ. Arestis draws upon post-Keynesian theory to articulate a representative post-Keynesian model capable of empirical testing. Lavoie seeks to develop theoretical foundations in a post-classical synthesis which draws upon contributions from not only the three strands of post-Keynesian thought but also from the institutionalists, (Marxist) radicals and the neo-Ricardians. Among the principles that the two authors identify as post-Keynesian, both identify methodological realism as a feature distinguishing post-Keynesianism from the neo-classical paradigm. Arestis claims that "theories, then, should represent economic reality as much as possible" (1992: 94), therefore "an emphasis on realism is also an essential characteristic of post-Keynesian economics" (p. 95). Lavoie notes that "whereas neoclassical analysis can be realistic only in its auxiliary

hypotheses, post-classicals require realism at the level of their initial and essential hypotheses" (1992: 8).

The reception of these two books was mixed. On the one hand, the exercises by Arestis and Lavoie did demonstrate that a coherent body of thought was possible. Yet, the products were not without controversy. In his review of Arestis, Prasch (1996b) finds that "as an introduction to post-Keynesian theory many sections are too abbreviated, and others too abstract" (p. 277) and that "a more complete survey of the literature might have been warranted" (p. 277) in the project to develop a representative post-Keynesian model.

Lavoie's attempt at a synthetic reconstruction is controversial as well. The author himself recognizes the potential for controversy: "It is acknowledged that some of the contributions cannot be easily integrated or that some of the authors may make strange bedfellows" (Lavoie 1992: 2). In his review, Prasch agrees with Lavoie, noting that:

> The attempt to create a synthesis requires modification or rejection of some important material. As such, this project is intrinsically controversial since some theorems have to be re-contextualized and others challenged or modified in order to be rendered compatible with a synthesis of the positions which co-exist within the 'post-Classical' pantheon (Prasch 1996a: 465).

In particular, the chapter on credit and money is interpreted more as a position piece than a synthesis of post-Keynesian monetary thought. While post-Keynesians are said to hold a theory of endogenous money, there is an active debate between the 'horizontalist' and the "structuralist" camps. The key point of contention is the behavior of money supply curves: horizontal versus up-sloping. Lavoie's chapter on credit and money is interpreted more as a horizontalist position piece than as a synthesis (p. 468).

What is interesting about one of the reviews of Lavoie's book is that the reviewer disputes the claim of realism intended in Lavoie's synthesis. Kregel asserts that "it is here that the 'danger of realism' as the organising principle for PK theory becomes evident" (Kregel 1993: 1315). Kregel is not persuaded by Lavoie's selection and reconstruction of the theory of money and credit which rejects "some of the most representative American work in the theory of monetary production" (p. 1316). The issue seems to hinge on whether horizontal money supply curves are deemed more "real" than positively-sloped money supply curves and the implication of this position on theoretical relations between money, liquidity preference, interest rates and prices.

What is significant about the discussion that has been generated by the publication of these two books is that both the selection of theoretical matter in articulating a model (as demonstrated by Arestis) and attempts at synthesis of theoretical contributions (as shown by Lavoie) are exercises that may be met by criticism within the post-Keynesian community. While critique is embraced as a necessary part of a healthy, evolving discourse, a larger question is whether the attitudes held by members of the post-Keynesian community show a positive willingness to engage attempts at synthesis or rather display a reluctant conservatism.

In addition to identifying realism and other presuppositions[18] which give post-Keynesianism its coherence, there are two other features of these textbooks which signify key moments in the evolving post-Keynesian discourse. One aspect is the particular

[18] Lavoie (1992: 7-14) cites 4 core essences of the post-classical program which distinguish it from the neo-classical programme: procedural rationality (vs substantive rationality), organicism (vs individualism), analytic focus on production (vs exchange) and epistemic realism (vs instrumentalism). Arestis' (1992) list of unifying presuppositions includes historical process, uncertainty, the role of institutions, recognition of social stratification and realism along with "the principle of effective demand as the backbone of Post-Keynesian" (p. 88) .

version of realism which Arestis suggests is characteristic of post-Keynesianism. He adopts Lawson's critical realist position. "The issue here is a debate between critical realism and positivist positions within philosophy and methodology. The realist views the economy and society as an open system; the positivist views it as closed" (Arestis 1992: 95). That *critical* realism and not a rival version of realism such as that of Maki is selected is an important moment which will be seen later.

The other significant feature is Lavoie's illustration of a possible synthesis between post-Keynesian thought and the contributions of other heterodox schools of political economy. He demonstrates that "several strands of non-orthodox economics can be regrouped under the same umbrella, notably the post-Keynesians, the neo-Ricardians, the (Marxist) Radicals, and the Institutionalists" (Lavoie 1992: 2). Following Henry (1982) and Eichner (1986), such a synthesis or reconstruction is what Lavoie calls the "post-classical research programme" (p 2).

3.2 The Lawson-Dow Proposition

With the emphasis on realism and synthesis, the works of Arestis and Lavoie had set the stage for the next act in the unfolding post-Keynesian discourse. In the next section, Lawson and Dow propose that critical realism be the philosophical foundation of post-Keynesian economics.

3.2.1 Lawson: Coherency through Critical Realism

Lawson (1994) enters the coherency debate with the argument that although post-Keynesianism does not demonstrate a coherency at the level of substantive theory, it does exhibit a coherent philosophical perspective, a perspective whose features correspond

with critical realist principles. Embracing critical realism as the philosophical foundation of post-Keynesian economics could resolve the coherency debate.

While recognizing the unifying effects of both a shared opposition to the perceived economics orthodoxy and a common concern for methodological questions, Lawson agrees with many of the appraisals of the post-Keynesian literature that there does not appear to be any cohesive body of substantive thought. He writes:

> At the level of concrete substantive issues, post-Keynesianism gives the impression of being little more than a collection of largely unrelated questions, aims, theories, and arguments united only in their claimed status as constituting alternatives to contemporary orthodoxy (Lawson 1994: 504-5).

He cites previous appraisals (Hodgson, 1989, Dow, 1990, Hamouda and Harcourt, 1988) to support this contention. The implication of this state of affairs within the post-Keynesian school is the lack of an alternative set of theories that are able to persuade adherents to the consensus view of that post-Keynesian thought has superior explanatory power.

However, at the philosophical level, Lawson argues that post-Keynesianism is coherent. He is in accordance with several post-Keynesians with the observation that "at a very abstract or general level various substantive themes or emphases do appear with a high degree of frequency" (Lawson 1994: 504). The economy as a dynamic historic process, uncertainty, concern with distribution, the effective choice of agents, and the role of institutions are some of these recurring general themes Lawson cites (p. 504). Note the overlap with the features given by Lavoie (1992) and Arestis (1992). What's more, these general features correspond with several principles which characterize a critical

realist perspective:

> The more general or abstract of the commonly identified characterizations of Post Keynesianism appear to fall easily in place – as reactions to the results of positivism and/or manifestations of insights of the critical realist alternative (p. 525).

For example, the post-Keynesian objection to the neoclassical assumption of ergodicity is consistent with the critical realist opposition to the implied ontological view by the mainstream of a reality characterized by constant conjunctions of atomistic events. Further, the post-Keynesian emphasis on fundamental uncertainty as a ubiquitous feature of the real world corresponds with the critical realist principle of epistemological uncertainty where knowledge held by both economic decision makers and economic investigators themselves is incomplete and fallible.

If it is recognized that post-Keynesianism achieves its coherency at a philosophical level similar to critical realism, there are some implications. First, post-Keynesianism would relinquish the intent to present a consistent body of substantive theory as a capable alternative to the neoclassical theoretical set. A "capable alternative" is meant as an array of theories capable of challenging the consensus view and persuading the opinion of the majority of economists. Second, post-Keynesianism would still face the difficulty of distinguishing itself from other rival schools within political economy that may share a similar philosophical perspective as post-Keynesianism yet display different theoretical conclusions. Third, the existence of different and contradicting theoretical conclusions within the post-Keynesian body of thought remains an outstanding issue.

These implications are not problematic, according to Lawson, if the post-Keynesian community embraces this argument that the strength of the post-Keynesianism

lies in its philosophical perspective that can accommodate a diversity of theoretical claims within it. If it is accepted that there is some correspondence between the philosophical perspective of post-Keynesianism and critical realism, one may extend this further and claim, as Lawson does, that the post-Keynesian philosophical perspective is in a position to be regarded as "ground-clearing device" (p. 525) like critical realism, which provides a framework for perceiving economic reality and assists in the critical assessment of theoretical claims. Yet the perspective "cannot do the work of science" (p 525). Under the level of philosophical perspective lies a plurality of methods that the investigator may employ in the actual work of science. It shouldn't be a surprise that a diversity of theoretical conclusions results from this open methodological practice.

Further, allowing and encouraging theoretical diversity is a positive attribute of the post-Keynesian project, again if this critical realist interpretation of post-Keynesianism is accepted. Given the critical realist principle that human knowledge is fallible with pervasive historical contingency, it follows that the pursuit of theoretical claims which demonstrate the most persuasive explanatory power given the context of analysis would benefit from drawing from a rich pool of competing claims. To quote Lawson:

> It is, then, not surprising, and indeed it is perfectly desirable, that competing accounts are sought –even if the aim must be continually to seek to determine, and then provisionally at least to maintain, those accounts that provide the more adequate (explanatorily powerful) expressions of the relevant aspect(s) of reality (p. 526)

Thus, the observation of a diverse set of competing claims within post-Keynesianism is interpreted as a positive feature of the school, a feature which perhaps should be cultivated within explicitly recognized philosophical perspective such as critical realism.

This is Lawson's proposal to resolve the coherency debate. There are two other directions for resolving the coherency debate. One choice is to continue the project begun by Arestis and Lavoie in attempting a synthesis at the theoretical level among the strands of post-Keynesian thought. As remarked earlier, it does not appear that the Arestis-Lavoie synthesis project is in opposition to the Lawson proposal. With the former, the emphasis is on the substantive level while recognizing the overarching philosophical perspective as a realist one.

The other direction for achieving coherency at the theoretical level involves stopping attempts at synthesis between the various strands within post-Keynesian economics (as well as with other schools of thought) and instead dropping one or two of the strands. Already in the post-Keynesian literature, there have been arguments for halting attempts at synthesis between the "fundamentalist" post-Keynesians and the neo-Ricardians for the reason of irreconcilable differences in philosophical perspective. Such a narrowing of the intellectual resources may also be accompanied by stricter methodological conventions. Such a strategy may be read as an "in order to lick 'em, join 'em" strategy where post-Keynesianism would imitate the neoclassical consensus in its singularity of vision and method. These are three possible directions that members of the post-Keynesian community may consider in the continuing debate on coherency and ultimately the future of the school.

3.2.2 Dow: Babylonian Pluralism, Critical Realists and the Post-Keynesian Methodology

In her 1999 paper, Dow both endorses Lawson's argument that post-Keynesianism can find coherency at the level of philosophy and extends the argument into a proposed project that re-orients the nature of the post-Keynesian discourse. Her

proposal is summarized into four sections. In the first section, the correspondences between post-Keynesian thought, Babylonian mode of thought and critical realism are demonstrated. The conclusion is that embracing critical realism as the philosophical foundation of post-Keynesian is feasible. In the second section, the relations between philosophical perspective, methodology, method and theory are re-visited and re-conceptualized in a schematic diagram. Given the problematic nature of the term "foundations" in the ontological sense, the matter of mutable, transitive philosophical foundations is qualified. The third section considers the exercise of delineating post-Keynesian economics within this framework and investigating the relations of post-Keynesian economics with other schools of economic thought. In the final section, an argument for greater methodological awareness in the post-Keynesian discourse is made with attention given to the role of the methodologist.

Dow finds the critical realist framework for inquiry as explained by Lawson is consistent with previously proposed descriptions of the philosophical perspective which grounds post-Keynesian theory and method. In particular, the consequences of a critical realism for methodology are similar to the methodological consequences of a Babylonian mode of thought, a philosophical perspective that has been argued to characterize the post-Keynesian pluralist approach to method (Dow 1990b).

First, a point should be made about terminology. Lawson uses the expression *philosophical* perspective (Lawson 1994: 506) to mean an ontological position and its consequent epistemological position. Dow uses the term *mode of thought*. They are treated here as equivalent. This is Dow's intention as well (Dow 1999: 22). Other equivalent expressions used throughout are *vision of reality* and *world view*.

What is a Babylonian mode of thought? The Babylonian mode of thought is a world-view which permits the investigator to begin inquiry from any set of axioms or starting points and use different forms of reasoning. Dow understands mode of thought to refer to "the level (of thought) at which a particular world-view and technique of analysis are appraised" (Dow 1990a:145). A mode of thought implicitly features a particular view of reality, a set of glasses through which a person observes and interprets the world. This allows an investigator to order one's thoughts about these observations/interpretations, forming the basis for theorizing. Communication of theories is facilitated by shared modes of thought. Misunderstanding can occur between two people in conversation who hold different *world-views*. This has been suggested to be a principal source of controversies within the economic discourse.

The Babylonian mode of thought contrasts with the Cartesian-Euclidian tradition. The Cartesian-Euclidian mode of thought finds its intellectual roots in the work of philosopher-mathematicians of the same name. This tradition assumes that its object of inquiry, whether it is geometric figures or phenomena in the social realm, is ordered in such as way that it may be known through analysis. The object is a complete, closed system that investigators are ultimately capable of being fully aware. We can come to know the object through the reconstruction of analytic findings into a representation of the object; in other words, a theory. The mode of thought is characterized by its monist stance on method. It relies entirely on axiomatic-deductive reasoning. The logic employed in reasoning is dualist in that it holds that every aspect of the object of analysis may be classified as a binary relation. In other words, for a given system of entities that is described using a category x, every entity within the system may be classified as x or

as not x.

Mathematics is the exemplar discipline in which the Cartesian-Euclidian mode of thought is ubiquitous. Mathematics aims to develop complete logical systems which rule out the possibility of "2+2=5". The success of holding this mode of thought when investigating physical reality (e.g. physics) or social reality (e.g. economics) hinges on whether the theoretical representation of reality can be shown to correspond with reality. As stated earlier in the discussion about critical realism, this correspondence is dependent on reality or parts of reality being actually closed. In economics, the lack of success in achieving robust theories may be explained by defenders of the Euclidian-Cartesian mode of thought by arguing that the discipline has not yet developed methods that allow tractable analysis which reveals the truth of reality in its theoretical representation.

The Babylonian mode of thought recognizes that the Cartesian-Euclidian axiomatic-deductive approach is not the only approach that one can employ to arrive at mathematical knowledge. The essential feature of the Babylonian approach is that it does not require that inquiry begin with a single set of fundamental axioms or first principles. Rather, one can employ several lines of reasoning where each line may begin at a different set of axioms or starting points. In contrast to the Cartesian-Euclidian monist approach to method, the Babylonian mode of thought is pluralist.

Also, this mode of thought rejects the restricted use of dualist logic in reasoning. The argument against the strict use of dualist logic is that the exercise of classifying all entities under analysis as either belonging or not belonging to a particular class is descriptively erroneous. Such a binary classification approach which forms the basis of dualist logic may be an inappropriate way to characterize a particular set of

heterogeneous entities. In trying to categorize things in terms of black and white, one is forced to ignore numerous shades of grey. An example from economics that Dow uses is the rational-irrational dual (Dow 1990: 149) that is employed in mainstream economics. Restricting the categorization of agents' decision-making behaviour as either rational or irrational precludes the notion of bounded rationality, a concept employed by post-Keynesians in their realist description of agent behaviour. Dow cites the examples of Hegelian dialectic logic and intuitionist logic as other modes of reasoning which undermine the "universal applicability" of dualist logic (p. 144). Within the argument for pluralism in method lies an argument for pluralism in mode of logic applied in reasoning.

Dow draws this term Babylonian from an explanation by physicist R. Feynman of a non-axiomatic style of mathematical reasoning. In his answer to the question of whether there is a single set of axioms from which to deduce all of physical law, Feynman argues that this is not the case even in mathematics, let alone physics:

> So the first thing we have to accept is that even in mathematics you can start in different places. If all these various theorems are interconnected by reasoning there is no way to say 'These are the most fundamental axioms', because if you were told something different instead you could also run the reasoning the other way (Feynman 1965: 46).

Feynman goes further and argues that a monist approach to axioms is not conducive to efficient inquiry.

> To decide which are the best axioms is not necessarily the most efficient way of getting around in the territory. In physics, we need the Babylonian method, and not the Euclidian or Greek method (p. 47).

Epistemologically, the Babylonian approach sees the grounds of the explanatory power of resultant theories as based on the relations of different lines of inquiry. If the different lines arrive at the same conclusion or if one line's conclusions support the

starting points of another line, the result is mutually reinforcing web of thought. If the conclusions from one line of inquiry are found to be incorrect, this event may weaken the web of thought but not necessarily cause its collapse. Scientific practice under the Babylonian mode of thought takes an inductive approach to making knowledge claims. Whereas the Cartesian-Euclidian mode of thought seeks coherence through the internal consistency of theory which is based on a single set of axioms, the Babylonian seeks coherence in a body of partial analyses (with different axioms) in a different, holistic way. "The binding factor of theories is a general perception of how the system as a whole works" (Dow 1985: 16).

With these two modes of thought briefly described above, a case can be made for the advantages of the Babylonian mode of thought. First, the Babylonian mode of thought may be the most effective approach to engaging complex systems. As previously discussed, explanatory success of the Cartesian-Euclidian mode of thought requires that the investigator has the ability to comprehend the extent and entirety of the system under analysis to allow complete classification. Also, the categories (as expressed in language) used to classify must have fixed meaning (Dow 1990: 143). There are two problems. One, economists do not have a complete awareness of all aspects of an economic system, even at the descriptive level of superficial observation. To deal with complexity, closures are invoked where some aspect of the system is held constant or simply assumed away. Thus, we observe the common practice within the discipline of partial analyses popularized by Marshall's ceteris paribus methodology. The question is how to achieve knowledge of the whole if the chief method of inquiry involves such closures in partial analyses. An additional obstacle to omniscient awareness is non-constancy of the system.

If the economy transforms, the object under analysis is not fixed. The second problem is that categories or labels do not have fixed meaning over time. This is has been demonstrated by several 20th century thinkers, including Kuhn (1962) and Derrida (1976).

Given the scarcity of empirical evidence of correspondences between theoretical propositions and observations, combined with arguments for human free will, it is a reasonable position to believe that economic reality is a complex, unbounded transforming reality. It is admitted that the position of a closed, deterministic system reality may be defended on several bases, including the argument that future development in method will reveal the laws someday and all the apparent chaos will fall away like chaff in the wind, leaving the kernel of truth in our hands. In the argument here, the burden of proof is left with the defenders of this position.

If the Cartesian-Euclidian approach is not suitable for engaging a believed complex open system, what advantage does the Babylonian mode of thought offer? It offers effective explanation. If the purpose of inquiry is "to build up applicable knowledge" (Dow 1999: 21) with reasonable efficiency for practical reasons (e.g. policy options), the pragmatic Babylonian strategy with its multiple lines of inquiry would appear to be the preferred mode of thought.

The Babylonian mode avoids two obstacles to efficient inquiry that the Cartesian-Euclidian mode faces. First, by allowing different lines of inquiry to begin with different starting points, there isn't any time-consuming debate about what are the proper fundamental axioms or first principles. Second, the Babylonian strategy avoids the obstacle posed by inconsistency. In the Cartesian-Euclidian approach, the project is to

develop theories within a single formal framework founded on a strict set of axioms. In economics, the general equilibrium project is the exemplar of this research strategy. To use the metaphor of a jigsaw puzzle, investigators involved in this project putting together a puzzle whose pieces have not been created prior to the puzzle's assembly. The investigator is simultaneously creating the pieces as they are trying to fit them together. They must be careful to avoid a contradiction or an inconsistency lest the pieces don't fit together. Since the research focus under a Babylonian mode of thought is not focused on the fitting together of theoretical statements into a larger theoretical structure, the issue of inconsistency is of less concern. It does not cause progress in the project to grind to a halt. A larger problem for the Cartesian-Euclidian approach arises when one appraises the completed "puzzle", the theory. The "puzzle" is now a "map", a representation of reality. If there is discordance between the representative map and its object in reality, the knowledge claims associated with the theory is weakened. The position that reality is open featuring infinite processes underscores the epistemological status of any finite theoretical representation.

This leads to the final point about the advantages of the Babylonian mode of thought. The Babylonian epistemological vision sees "full knowledge (as) impossible to attain. Knowledge at all levels is treated as being incomplete in a fundamental sense" (Dow 1990: 148). The Cartesian-Euclidian position cannot accommodate partial knowledge which is nonetheless valuable in the instrumental sense such as for the basis of policy action. For example, despite the absence of complete full knowledge of the effects of pesticides on our water systems or the effects of carbon dioxide emissions on climate change, the partial evidence that has been amassed on these two issues has been

persuasive enough to induce policy action at a local (municipal) level and global level respectively. The Babylonian mode of thought allows an element of uncertainty within its epistemological position. This is similar to previously made arguments about the fallibility and transitivity of human knowledge. If this belief in fundamental uncertainty is accepted, the corollary is the position of bounded rationality. If complete full knowledge is unavailable to the investigator (just as it is unavailable to the economic agent), the investigator faces two choices: abandon inquiry or proceed with partial information. Necessity of action may propel the investigator to proceed. Decisions made using partial information avoid being categorized as irrational, which would be the case in the Cartesian-Euclidian perspective. The Babylonian mode of thought avoids this binary trap posed by dualist categorizing of knowledge and rationality, allowing investigators to proceed with bounded rationality.

Dow's assessment of post-Keynesian thought is that it "derives primarily from a Babylonian style of thought" (Dow 1985: 73). Echoing Hamouda and Harcourt (1988), the diversity of theoretical content and methods of analysis exhibited by post-Keynesians is indicative of the Babylonian approach which "represents a different choice as to how to represent reality" (1990: 353), a mode of thought which is ontologically world realist (belief that there is an objective reality) and epistemologically process truth realist (the priority of inquiry is to understand the underlying causal processes of reality). The particular world realist position is one of a complex open reality that presents the challenge of epistemological uncertainty. The solution is to amass evidence from a diversity of sources using a diversity of methods for the purpose of arriving at a concluding proposition whose probability of trueness is inductively grounded on the web

of amassed evidence. This methodological approach is "in effect to employ Keynes's sense of probability" (p. 353) which Dow considers underpinning the epistemology of post-Keynesian thought.

The reader may already detect the similarities between critical realism philosophical perspective and the Babylonian mode of thought. Although they draw upon different intellectual sources (R. Feynman, R. Bhaskar), these two philosophical-methodological positions have evolved in historical parallel and share several principles. Emphasis on the foundations of methodology at the philosophical level, an ontological vision of a complex open system reality featuring various causal forces at work within the system, and an epistemological position that recognizes the value of partial knowledge in order to build up knowledge that is reliable as possible (Dow 1999: 22-3) are three principles that critical realism and Babylonian thought have in common. Dow recognizes the compatibility between Babylonian thought and critical realism and endorses Lawson's proposal that critical realism be sought as the philosophical foundation of post-Keynesian economics (p. 23).

Having demonstrated the similarities between critical realism and Babylonian mode of thought, Dow then proposes a new way of viewing the relations of philosophy, method and theory. Where once philosophical foundations of method were tacitly assumed and thus implicit in the economic discourse, Dow seeks to make the level of philosophy explicit. The philosophical level can be divided into two sections: 1) the philosophical *vision of reality* featuring an ontological position with its consequent epistemological aspects, 2) principles governing method from this vision of reality: *methodology*. The orientation of the vision of reality and the resulting methodology

determines what methods are acceptable. As demonstrated above, a critical realist vision of reality leads to a methodology which allows pluralism in method choice. On the other hand, an empirical realist vision of reality leads the monism of a Cartesian–Euclidian methodology. Choice of method is more restricted.

Dow treats the level of philosophy (with its two components, vision of reality and methodology) as the foundational level. From these foundations, method, theory and policy follow in logical order. In research practice, the vision of reality determines the methodological principles which constrain method choice. Method choice affects theory development which in turn influences policy proposals. When vision of reality and methodology are tacitly assumed, it may appear to the investigator that the starting point is method, for example, the application of econometrics or mathematical modeling to the research question. Thus, it is not unusual to find in undergraduate textbooks the following model of research: *facts* inform *theory* which informs *policy* (Blomqvist, Wonnacott and Wonnacott 1987: 37-9). Method reveals the facts which form theory.

Before this discussion continues, the meaning of foundations must be qualified. Dow uses the term foundations to signify the initial level in the logical order of levels in this characterization of the structure of inquiry. This is not to suggest that the philosophical level is immutable in the sense of an axiomatic theoretical structure. The ontological-epistemological position articulated by critical realism is subject to transformation as well, just as every other category of knowledge is held to be transitive. "Philosophical and methodological foundations should not be treated as fixed axioms, but rather themselves be put under scrutiny, along with practice, whenever conflicts between methodology and practice arise" (Dow 1999: 30). Knowledge gained through practice

(the employment of method(s) to certain research questions in the development of theory) may raise questions about the philosophical foundations, specifically its ontological-epistemological position. As Dow notes, "there is still a two-way causal process running between knowledge and ontology" (p. 29). The ensuing investigation and debate in the discourse may affect the philosophical vision of reality or world view, bringing about a paradigm shift in the Kuhnian sense but at the deep (high) philosophical level or as Lawson states, "the outcome will presumably be a transformation in, or a transcendence or sublation of, critical realism" (Lawson 1999: 5). Yet, to demonstrate a plausible reorientation of the methodological discourse along philosophical lines, the principles expounded as critical realism are accepted as provisional yet sustainable for the purpose here: the outline of a new philosophical-methodological approach to economics (Dow 1999: 30).

If we accept Dow's contention that levels of thought follow in a logical order, namely, vision of reality, methodology, method, theory and policy, we may construct a visual diagram of these relations in order to facilitate examination of a body of economic thought such as post Keynesianism. There are several good candidates for models, each with their particular advantages. Since Dow uses the term foundations to designate the philosophical vision of reality, the metaphor of a house seems appropriate with each floor representing a level in the logical order. This is a bottom-up model where the direction of causality goes from the bottom foundations upward. See figure 1.

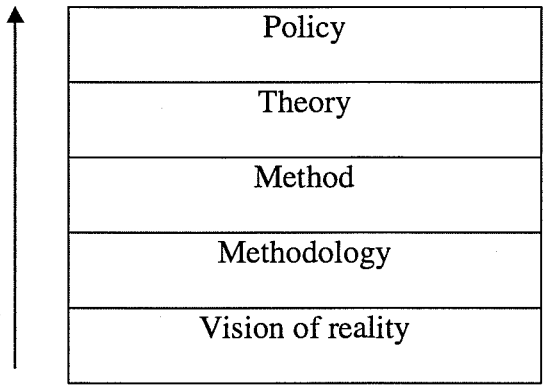

Figure 1: The House Model

There are some drawbacks to this house model which will soon become apparent. It is the intention of Dow to use the resulting framework to identify, understand and classify different approaches or "schools" of economic thought such as post Keynesianism. If we accept that schools of economic thought (whether unified by theory content or philosophy/method) can be understood in terms of their philosophical and methodological foundations (p. 20-1), then we have a basis for classification. Schools which share the same general ontological-epistemological vision may inhabit the same "house" so to speak. In this discussion, two different ontological visions have been characterized; the open-system ontology of critical realism and the closed-system ontology of empirical realism. We can visualize two houses, each with different philosophical foundations. There is the "open system" house and the "closed system" house. Within the open system house, several schools may dwell on the level of theory. While they all may share the same general vision of reality and ascribe to the same methodological principles (in the case of critical realism, methodological pluralism), the distinctive schools may differ in their *particular* view of reality. In the case of the open

system house, schools may have different understandings of the nature of an open-system reality, specifically social reality. To illustrate, Dow mentions that group or class phenomena would be the focus within the Marxian school while the individual would be the focus of the neo-Austrians (p. 26). This notion that several schools may be exist within the same philosophical house (or under that same ontological umbrella) was suggested by Lawson (1994). He observes that "Post Keynesianism is not really very different in structure from other contemporary, and reputedly rival, heterodox traditions-such as, for example, certain strands in the Austrian and Institutionalist schools" (p. 533). He follows with the call for "some fuller reconciliation between the different traditions grounded in a shared philosophical perspective" (p. 535).

How then should this task of reconciliation be approached? This framework (as illustrated here in the "house" diagram) can serve in the delineation of schools of thought vis-à-vis one another (Dow 1999: 25), identifying their unique features and perhaps more importantly, finding the areas of similarity and overlap.

> Since Post Keynesians share an open-system ontology with other non-orthodox schools of thought, each of which employs a range of methods to address a range of questions, there is bound to be some overlap between schools (p. 29).

Why is the exercise of classification useful? When comparing different bodies of thought, whether at the level of theory or philosophical foundation, it helps render intelligible the objects under analysis which assists in engagement and understanding. The similarities and differences between various schools become clearer. As this task includes two new levels or dimensions, vision of reality and methodology, which tend to be left implicit, the exercise of classification will differ from a more conventional classification where the focus is on the level of substantive theory. This was the author's

experience during his history of economic thought classes. More basic, the practice of inquiry necessitates classification (even if only provisional). As Davidson asserts, "a precise taxonomy is, however, a necessary precondition for all scientific inquiry" (1992: 29). He follows Keynes's example in advising that "to avoid such semantic confusion, it is necessary to provide a dictionary of often used, and misused, words up front to assure all understand exactly what the concept denotes" (p. 29).

The proposition to identify common ground between the schools and seek synthesis has existed prior to critical realism's entry into the debate. The idea of synthesis among separate strand of thought, both within a school and between schools, resonates in Harcourt and Hamouda (1989) and Henry (1993). Henry claims that:

> As a first approximation, one could describe the post-Keynesian research programme as resting on three pillars: Keynes, Marx, and Sraffa. (...) But the great synthesis has yet to be achieved. (...) I propose the term *post-classical* to designate a research programme based on the fundamental contributions of Marx, Sraffa and Keynes (pp 2-3).

The vision of a project aimed at a synthesis among strands and schools also appears in Lavoie (1992).

> One of the objectives of this book is to show that a synthesis of the various streams of post-classical economics as well as the various contributions to post-Keynesians economics is possible (p. 2).

To further underscore this point, one may observe the convictions of Robinson in the first edition of the *Journal of Post Keynesian Economics*. In regards to the strands of thought initiated by Keynes and Sraffa, "it is the task of post-Keynesians to reconcile the two" (Robinson 1978: 14). Following her discussion of the means to seek this reconciliation, Robinson declares that "we now have a general framework of long- and short-period analysis which will enable us to bring the insights of Marx, Keynes, and

Kalecki into coherent form" (p. 18).

It appears that a task ahead for the community of post-Keynesian scholars is to seek an understanding of post-Keynesianism both in terms of (1) the strands of thought believed to constitute post-Keynesianism and (2) the similarities and differences between post-Keynesian economics and other schools. This exercise of identifying, understanding, classifying and appraising could be done on the philosophical foundation (or under the umbrella) as articulated by critical realism. This exercise of this type hinges on the acceptance that post-Keynesianism shares a philosophical position akin to critical realism.

If this proposed exercise before the post-Keynesian community (and perhaps larger heterodox community[19]) is embraced, the exercise being the exploration of the substantive theoretical features of post-Keynesian economics while explicitly recognizing the philosophical plane on which the discourse takes place, Dow calls for greater methodological awareness among the participants in the discourse and a reinvigorated role for the methodologist.

Since the reorientation of the discourse involves "making explicit what was previously implicit", post-Keynesians will need to be more methodologically literate in order to engage in debate, debates that in the past "were fruitless precisely because of a lack of awareness of methodological differences" (Dow 1999: 18). This underscores the possible efficiency gains that would be experienced with greater methodological awareness. This recommendation is in the spirit of a recent movement within the

[19] Heterodox community refers to those schools of thought that do not follow the orthodox consensus. In addition to the post-Keynesian school, the community includes the Marxian, Institutionalist, Schumpeterian, Austrian, Feminist, Social and Sraffian schools. This is not an exhaustive list.

discipline which considers how economists communicate among each other.[20]

While the point of encouraging greater methodological awareness among post-Keynesian economists is to facilitate progress at the substantive level (as well as the levels of method and philosophy), caution must be maintained to avoid the discourse getting bogged down in methodological debate. This has been a past criticism of the post-Keynesian school where too much time spent on methodological debate creates a distraction "from the main activity, which is theoretical development, and the addressing of policy issues" (p. 16). What Dow intends is that the practicing post-Keynesian economist who is involved in theoretical and policy development have a rudimentary philosophical-methodological awareness which is in the back of the mind and "can be drawn from the subconscious to the conscious level when the need arises" (p. 17). It may be argued that such a methodological awareness should be part of every economist's training, including some knowledge of the history of economic events and processes and the history of economic thought.

The organization of work in economics reflects one of its hallmark concepts: the division of labour (although it maybe argued that hierarchy of prestige better describes the discipline's social organization). Within the post-Keynesian school, Dow makes a case for specialization in methodology. In the task of delineating post-Keynesianism on the philosophical place of critical realism, there is a special role for the methodologist. Dow's vision of the methodologist is quoted at length.

In general, the methodologist's job would be to:

1. maintain a focus on the foundational level not only to assist extraordinary science but also to assist in the development of the paradigm through

[20] This is a theme developed in McCloskey 1994. See Peter 2001 for a discussion of McCloskey's rhetoric argument in relation to the realisms of Lawson and Maki.

normal science

2. attempt to assist communication, and thus the settlement of disputes by clarifying the nature of disagreements, which (if unresolved) generally stem from disagreements about foundations

3. clarify issues by attempting to understand and explain the philosophical underpinnings of these issues (p. 20).

In particular, the methodologist would:

1. point out inconsistencies with professed methodology

2. clarify disputes that stem from methodological differences

3. spell out various methodological principles that have direct implications for practice (p. 27).

Note how Dow's view of the methodologist contrasts with the view of R. Harrod:

> Exposed as a bore, the methodologist cannot take refuge behind a cloak of modesty. On the contrary, he stands forward ready by his own claim to give advice to all and sundry, to criticize the works of others , which, whether valuable or not, at least attempts to be constructive; he sets himself up as the final interpreter of the past and dictator of future efforts (Harrod 1938 quoted in Blaug 1992: vi).

Rather than set up as the final arbiter of truth in the discourse, a role sarcastically suggested by Harrod, Dow sees the methodologist as a midwife who facilitates the delivery of progress through the discourse. If one envisions a community of post-Keynesians scholars featuring substantive theorists and methodologists, the interaction between the two groups should be of consultative manner governed by discourse ethics or what McCloskey calls *sprachethik* (Peter 2001: 577).

To summarize the proposal put forth by Lawson and Dow, it is argued that post-Keynesian economics achieves coherency at the level of philosophy. Features of post-Keynesianism that are identified as its essential philosophical features are found to

correspond to those features that characterize critical realism. Post-Keynesianism may embrace critical realism as its philosophical perspective. An advantage is that pluralism at the level of method and theory is permitted on critical realist foundations. This is not a departure in the post-Keynesian approach as pluralism was permitted by another philosophical position argued to characterize post-Keynesianism, that being the Babylonian mode of thought. This re-establishing of relations between philosophy, methodology, method and theory provides a framework within which post-Keynesianism can explore itself and its relations with other schools of political economy. The delineation of schools on the critical realist plane can demonstrate differences between schools and can also provide the opportunity for identifying similarities, providing the opportunity for theoretical synthesis. If this proposal is accepted by the post-Keynesian community as a new task before it, the task should involve a greater methodological awareness among scholars and a greater use of methodological specialists in the discursive process.

4 The Sraffian Question

4.1 The Walters and Young Critique

If it is accepted that critical realism provides a philosophical basis that gives post-Keynesianism coherency, a question that follows is whether critical realism provides the *appropriate* basis. Walters and Young (1999) argue that the implications of adopting CR as a philosophical basis would lead to the prohibition of certain methodological practices within the three strands, "narrow(ing) the range of insights and diminish(ing) the early pluralism" (p.105). The cost of a reconstructed post-Keynesian economics along critical realist lines is a hollowing out of the school's methodological and substantive content. This critique also finds the epistemological framework of CR to be vague. In their view, CR fails to give post-Keynesianism a sufficient procedure for theory selection and concrete guidelines for empirical inquiry. This line of critique by Walters and Young extends from their 1997 essay where they examined the coherency of post- Keynesian economics in terms of foundations, methodology, theory and policy agenda, and within the strands themselves. Their conclusion in 1999 is similar to the 1997 argument in that they are suspicious of attempts to find coherency either at the level of methodology or of theory (through synthesis) in order to construct an alternative to orthodox economics. The cost is loss of valuable theoretical content by the original contributors to the school in an "unnecessarily destructive battle for the dominant position within the pantheon" (Walters and Young 1997: 347).

Walters and Young accept Hamouda and Harcourt's designation of three dominant strands with post-Keynesianism and examine how the methodological prescriptions of CR would affect the methods characteristic of each tradition. Critical

realism find fault with several methods that rely on closures for their success. Specifically, the reliance on axiomatic-deductive reasoning (as found in formal modeling) and econometrics in the orthodoxy comes under scrutiny. Walters and Young find that such methods are used in the three post-Keynesian strands. The deductive formalism of the Sraffian (neo-Ricardian) approach, the econometric analysis by Kalecki and the generalizing method through deduction of Keynes and some fundamental Keynesians (e.g. Davidson) are at odds with methodological principles of CR. Such methods are more appropriate for investigating a closed-system reality such as that presumed by the orthodoxy rather than an open-system reality supposed by critical realism. If closed-system technique gives closed-system results, then this substantive product is inconsistent with the overarching philosophical-methodological position. The issue, according to Walters and Young, is that "if the prescriptions of CR are taken seriously, then, in fact most of the substantive theoretical positions are compromised" (Walters and Young 1999: 112).

Given this warning, it would be useful to examine the implications of critical realism on practice and how this may affect a particular strand of thought within post-Keynesianism. This will provide a more informed understanding of what is at stake if critical realism is embraced as the philosophical framework of post-Keynesianism and the project of re-interpreting and reconstructing previous substantive work is begun. For the purposes here, the Sraffian strand will be examined. The contention that critical realism is incompatible with Sraffian political economy is first situated in the larger debate over the status of the Sraffians (or neo-Ricardians) within the post-Keynesian school. The Sraffian method and focus of analysis are considered in the history of

economic thought, touching on several intellectual movements that have in part shaped the development of the approach. Basic methodological concepts such as analysis, abstraction, and modeling are discussed and the use of mathematics is examined. While the purpose of the examination is to evaluate the Sraffian approach, methodological practices within orthodox economics is included in the appraisal. While a first glance may suggest that the Sraffian approach does conflict with critical realist prescriptions, a deeper consideration of its method and approach combined with the insights of some recent substantive contributions points to a possible reconstruction of Sraffian approach that is both compatible with critical realism and the other strands of post-Keynesian economics.

4.2 The Debate

Walters and Young observe that the Sraffian approach to theorizing features the use of strict closure assumptions in its logical deductive style of reasoning. Their focus of analysis is the conditions of variables in long-period equilibrium. This apparent deductivist mode of explanation with reliance on an equilibrium concept would appear to place this Sraffian strand within the same company as general equilibrium theorists. Therefore the Sraffian strand faces the same philosophical critique from the perspective of critical realism. Specifically, if a deduced functional relation between variables is claimed to be a strict causal structure invariant over time and space and there is no empirical evidence to corroborate that such a closure exists, there are reasonable grounds to doubt the structure's causal activeness on other variables. It is even reasonable to doubt its existence. If the deduced causal structure becomes the foundation for further model construction, the possibility of success in this line of inquiry is dubious. Walters

and Young explicitly spell out the implications of adopting a critical realist methodological perspective for the Sraffian strand:

> An underlying causal structure that would license this form of logical/deductive system would involve a positivist event regularity view of causation. The implication of this is that the adoption of CR as defining Post Keynesianism would result in the rejection of Sraffian analysis (p. 114).

It is recognized that under the Sraffian label, there is more than one approach. Roncaglia's 1991 survey identifies 3 "schools" that have developed in the post-*Production of Commodities by Means of Commodities* era: the Ricardian school led by Pasinetti, the Marxian school led by Garegnani and the Smithian school led by Sylos Labini (pp 187-219). For the purposes here, I follow Pratten's approach (1999) and refer to the works of Garegnani, Eatwell, Milgate and Bharadwaj as the Sraffian strand under examination. In other writings, these theorists have been identified as the dominant Sraffian group (Lavoie 1999b: 1095). They are also referred to as the neo-Ricardians.

Walters and Young's suggestion that the adoption of critical realism would lead to the rejection of the Sraffian strand comes at a moment in the discourse when some post-Keynesians are evaluating the relationship between the strand and the larger school. While the historical development of the three strands has been an inter-related affair, especially given that key early post Keynesian economist were based at Cambridge (Keynes, Robinson, Sraffa), relations between the fundamentalist Keynesian and Sraffian strands became tense in the early 1980s over substantive differences. In their attempt at a synthesis between Sraffa's prices of production and Keynes's principle of effective demand, the neo-Ricardian dismissed the significance of short-period phenomena of money, time and uncertainty (Fontana and Gerrard 2002:11). As these are central tenets in the fundamentalist Keynesian approach, a rift between the two strands developed,

leading to the collapse of the Trieste Summer School project. The school objective to explore similarities and differences and seek common ground is felt to have not been met, but this may largely have been the result of orthodox views in both camps dominating the dialogue (Lavoie 1999b: 1095).

The methodological reflections by post-Keynesians since then have led to the articulation of various claims and proposals, many which are under consideration here. For example, Arestis, Dunn and Sawyer (1999) claim that "a commitment to open system theorizing" gives methodological coherence to post-Keynesianism. It is interpreted that for these authors, such a commitment becomes the litmus test for coherent theories and research approaches. It is not surprising that these authors choose to part from the Hamouda and Harcourt's (1988) characterization and propose that there are "three major strands in Post Keynesian economics, derived from Kalecki, Keynes and the institutionalists" (Arestis, Dunn and Sawyer 1999: 546). Note that the Sraffian strand has been replaced by the institutionalists. Dunn (2000) later goes further and announces that the perceived reliance of the Sraffians on a closed system deductivist methodology disqualifies them from an approach unified around commitment to open-system theorizing and therefore "the time has come for Post Keynesians to formally part company with the Sraffians and to jettison the burdensome accusation of negative critique that is chiefly identified with their contribution" (p. 550). This view is consistent with Pratten (1999) whose in-depth consideration of the neo-Ricardian issue leads to the conclusion that the neo-Ricardian school:

> can either retain its commitment to deductivism, and continue to run parallel to, if not actually constitute a sub-strand of, orthodoxy, or abandon this commitment and in the process lose what are perhaps its most distinctive characteristics (p. 35).

Further evidence of the movement within the post-Keynesian community to sever relations within the Sraffian school is the exclusion of a chapter on the Sraffian contribution in the *New Guide to Post-Keynesian Economics* (2002), a sequel to Eichner's 1978 edited collection of essays on several post-Keynesian themes. The 1978 volume had featured a Sraffian chapter by Roncaglia.

On the other side of the debate is the argument for the sustaining relations between the Sraffians and the larger post-Keynesian school. This argument goes back to Robinson's essay in the first issue of the *Journal of Post Keynesian Economics*. Robinson re-accounts the relations between Keynes and Sraffa. Apparently, neither took much interest in the other's *magnum opus* (the *General Theory* and *Production of Commodities by Means of Commodities*), thus "it is task of post-Keynesians to reconcile the two" (1978: 14). The reason is more than sentimental. Sraffa's system was built on technical conditions, not marginal relations between capital and profit. Use of the Sraffian constructs would immunize post-Keynesians from falling back on neo-classical equilibrium concepts in developing a long-period analysis. Sraffian analysis also would be strengthened in its incorporation of fundamentalist Keynesian insights into the significance of money, time and expectations.

> Long-period balance could be continuously maintained only on a steady growth path where confident expectations about the future can be maintained, continuously fulfilled, and so renewed. This is not something that actually happens (p.16).

Robinson's point is that the two approaches can complement each other.

The view that the role of the Sraffian contribution is central within post-Keynesianism is reinforced by Henry (1993). In addition to the value of Sraffa's

theoretical contributions on production prices and income distribution, Henry recognizes the value of Sraffa's method. Henry cites Bose's admiration of Sraffa's application of analytic tools "which could be wielded as effectively as a surgeon's or welder's tools, to dissect or dismantle, and then reassemble the 'unseen' interconnections of the economic process" (Bose 1975:11 cited in Henry 1993:10). This may be interpreted as an exercise which identifies a potential mechanism that exists in the deep, unobservable level. The identification of these relations maybe regarded as a 'potential" hypothesized mechanism, a retroductive inference that requires assessment. Another interesting point made by Henry about the role of Sraffa's contributions is that while the insights into production prices, income distribution and the classical problem of value are interesting in the analytic framework of logical time, they "become really useful only if the analysis is pursued in historical time" (Henry 1993: 8). Henry foreshadows the growing consensus in post-Keynesianism about the treatment of time in a historical sense which transcends the distinction between the short-run and the long-run.

Another voice that supports the inclusion of the Sraffian strand within post-Keynesianism is Lavoie who while being a proponent of realism in economics, is careful not to reject neo-Ricardian contributions due to the perceptions that the contributions are not realistic. In Lavoie's view, the Sraffian strand does share realist objectives with other post-Keynesian strands and the pure Sraffian model may be regarded as a "stylized fact" without the theoretical baggage of the marginalists:

> This search for the persistent elements of the system may be associated with the post-Keynesian focus on the most essential rather than the most general elements of the economy. Furthermore some neo-Ricardians describe the pure Sraffian model as a snapshot, a photograph, of the existing economic system. Consequently few hypotheses are superimposed upon the observed technological facts. Technical coefficients are what are observed (Lavoie 1992: 9).

Further, Lavoie argues that the collapse of the Trieste Summer School project can be attributed to the overemphasized attention given to the relations between the dominant views within the fundamentalist Keynesian and Sraffian camps. Lavoie notes that dissident views in both camps show promise in seeking common ground, specifically in questioning the short-run/long-run distinction and the claim that market prices gravitate towards prices of production (Lavoie 1999: 1095). Traverse analysis in a dynamic historical-time framework transcends the short-run/long-run problem and would allow examination of the relations between actual values (e.g. market prices) and "real" values (e.g. production prices) over historical time (p 1098).

Amidst the arguments for the exclusion/inclusion of Sraffian contributions in the critical realist-informed post-Keynesian school comes a note from Lawson (1999b) who reminds the audience that while CR takes a critical stance against methods which presuppose a closed-system reality, a commitment to open-systems theorizing does not by necessity prohibit the use of formalist methods. The success of formal analytic methods requires the presupposition of *some* closures (read local closures). The global open system ontology as articulated in CR can contain local closures. Evidence of local closure is seen in both the contrived closures of the experimental situation and in the observation of demi-regularities in the natural and social spheres. Therefore, Lawson feels that "the opponent of critical realism is not the post Keynesian or whoever, seriously attempting to find out if (or demonstrate that) in certain conditions some closed-system models or whatever could contribute to enlightenment" (p 8).

4.3 Background to the Sraffian Approach

Given these arguments and clarifications, what is the future of the Sraffian strand

within a CR-informed post-Keynesian economics?

First, we must begin by outlining the background. The starting point of the Sraffian strand begins with Sraffa's reconstruction of the classical surplus approach. The surplus approach as articulated by such classic thinkers as Ricardo and Marx is a perception of how the economy works in the most general sense; it is a gestalt. The essence of the surplus approach is that excess economic output characterizes production processes, an excess above what is necessary to sustain labour and capital during the production process. A focus of analysis is how this surplus is distributed and how this distribution affects subsequent production capabilities. Production is a circular, repetitive process. It may be viewed as a series of cycles or periods or as continuous, depending on the nature of that particular production activity or the needs of analysis. A key feature is the recognition that the commodities produced serve as either inputs for their own subsequent production, as inputs for other production processes, or as commodities for final demand users.

The predominance of the classical surplus approach among economists was later displaced by the marginalist approach that characterizes neoclassical economics. The marginalist perception of the economic system understands the animation of the system to be result of "small changes" in variables and the effect of these changes on other variables. The economic process is an equilibrating process among variables. Emphasis is on exchange rather than production. The process is perceived as linear rather than circular. The linear process begins with a rational, utility-maximizing individual with limited resources that are managed though direct consumption (or home production leading to consumption) or through exchange (bringing the resources into production) to

optimally satisfy preferences, the ultimate end in the process. This conception of social reality is atomistic rather than organic. Social relations are reduced to matters of exchange, thus social interdependency is understated. Relative prices are indices of scarcity rather than exchange ratios reflecting the social and technical requirements that permit reproduction. The idea of value shifts from an objective theory emphasizing material substance to a subjective theory of value that emphasizes utility.[21]

It was Sraffa's reaction to what he perceived as fundamental errors in the marginalist theoretical edifice that led him to resurrect the classical surplus approach. In his 1926 paper "The Laws of Returns under Competitive Conditions", Sraffa refutes the notion of a supply curve built on "laws of returns". The grounds for his critique are realist. The assumption of the laws of diminishing and increasing returns could be the foundation of a supply curve that could be applied to any industry, regardless of degree of competition, nature of the product purchaser and type of production activity, was erroneous if the law of returns varies by production situation. If the supply curve was unsound, then marginalist price determination (and by implication, the subjective theory of value) was theoretically faulty.

The Achilles' heel or weak thread in the theoretical web was found to be the relations between capital and the rate of profit (or interest rate), an investigation initiated by Robinson in 1953. If a quantity of capital can not be measured independently of distribution and prices, including the price of capital (i.e. the interest rate), it is not

[21] Instead of the terms objective and subjective, Mirowski uses substance theory of value and field theory of value to characterize the value theories of the surplus and marginalist approaches. The terms substance and field originate in 19th century physics theory. Mirowski argues that economic theorists, both classical and neo-classical, have drawn on physics as a source of metaphor unaware of the impending consequences for theory development and implied meaning. The field concept refers to "a spatial distribution of energy that varies with time" (Mirowski 1989: 66). For the neoclassical theorist, utility substitutes potential energy.

possible to represent the relations between the quantity of capital and its price in terms of well-behaved demand and supply functions (with their marginalist price analogues) amenable to price analysis. Without a price of capital to enter as data into the production function, the distribution of income shares cannot be calculated. This marginalist construct falls to an error of circularity. Sraffa succinctly summarizes the dilemma in his question: "what is the good of a quantity of capital ... which, since it depends on the rate of interest, cannot be used for its traditional purpose ... to determine the rate of interest?" (Sraffa 1962: 479).

In *Production of Commodities by Means of Commodities*[22], Sraffa offers a solution to the value problem that plagued the classical thinkers like Ricardo and Marx. The problem was of finding an invariable standard to measure prices of production without having to rely on measures of wages or profits. In his analysis, Sraffa avoids the controversial assumption of constant returns to scale. He succeeds in demonstrating the possibility of a non-marginalist theory of value. Again, his realist concerns are present in his reconstruction of the classical surplus approach.

> The marginal approach requires attention to be focused on change, for without change either in the scale of an industry or in the 'proportions of the factors of production' there can be neither marginal product nor marginal cost. In a system in which, day after day, production continued unchanged in those respects the marginal product of a factor (or alternatively the marginal cost of a product) would not merely be hard to find – it just would not be there to be found (Sraffa 1960: v).

At the heart of the Sraffa's analysis is the concept of the core. The core serves as the starting point for Sraffian research. The core is the metaphor for the relations between real wages, the surplus (or profits), the social product (or GDP), technical conditions (represented by technical coefficients) and prices of production. Real wages,

the social product and the technical conditions are the exogenous data which determine the prices of production and the surplus level, a snapshot (of an aspect) of the economic system at a moment in time. As technical conditions as well as real wage and the social product are taken as fixed in calculating the solution, the focus of analysis is construed to be in long-period equilibrium context where persistent forces (such as technical conditions) predominate.

The surplus approach, as it is portrayed here, contains features that seem to agree with critical realism. The gestalt of the surplus approach envisions the interconnections of the production system as represented by say, the prices of production. This organic, holistic view of production is in sharp contrast to the marginalist perception of an atomistic production reality. The surplus approach tacitly implies a structured, interdependent social process that is congruent with the ontology of social reality as put forth by CR.

In addition to displaying features associated with the CR social ontology, the Sraffian contributions can be argued to complement and indeed enhance the other post-Keynesian strands. For example, the fundamentalist Keynesian strand could be strengthened by incorporating Sraffian distribution theory with the principle of effective demand and eliminate the risks associated with relying on marginalist constructs that Keynes himself drew upon in building the *General Theory*, such as marginal efficiency of capital (Ciccone 1994: 391). Robinson saw Sraffa's work as the means of building up Keynes's short-run insights into the long-run (1978: 15-6).

Yet despite some correspondence with critical realism and the advantages that it

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[22] Hereafter referred to as *PCMC*.

could allegedly bring to Keynesian economics, the Sraffian contribution remains controversial within the post-Keynesian discourse. Recent critiques evaluate Sraffian economics on the level of methodology. Pratten, adopting the position that coherency within the strands of post-Keynesianism turns on a commitment to open system theorizing as articulated by critical realism, considers how the Sraffian strand relies on deductivist methods. In his evaluation, Pratten focuses only on the work of Garegnani, Eatwell, Milgate and Bharadwaj as the representative neo-Ricardian position.

4.4 Pratten: the case against the Sraffian

4.4.1 The core

Two organizing principles of the Sraffian strand that Pratten examines are the core and the centre of gravitation. As mentioned before, the core refers to the quantitative relations between wage level, output, technical conditions, surplus and relative prices. The identification and analysis of these relations originate in Sraffa's work in *PCMC*. Wage level, output and technical conditions are designated as exogenous variables while the surplus and relative prices are endogenously determined. The magnitudes of these endogenous variables are determined through the solution of a linear system of equations. This presupposes that the production system with its flows of commodities is appropriately represented as a system of linear relations. This depiction of a production system featuring only five variables is at a relatively high level of abstraction. It is claimed that analysis of the core forms the basis for the Sraffian reconstruction of the classical theory of value (Pratten 1999: 28).

The separation of these variables and their relations with other variables within the economic system constitutes a closure. This closure is said to be a necessary first step

in a wider analytic exercise. For instance, analysis in subsequent steps could examine the factors that determine the exogenous variables (wage level, output and technical conditions). This could involve not only the influence of variables that exist outside the core but also the reciprocal influences between the exogenous variables and the reverse influence of relative prices and the rate of profit on wages levels, output and technical conditions. The admission that the second field of analysis may feature factors of an historic and institutional nature that can not be described in terms of quantitative relations infers the recognition of an open system reality. Yet, the demarcation of the core and its analysis is claimed to be the necessary *first* step in an order of analytic steps (p 21). Even in an open system, the core is treated as a closed space of insulated economic relationships. The determinate nature of relative prices and the rate of profit (surplus level), given the exogenous data, suggest a constancy of relations and thus some sort of event regularity. Using the "if x, then y" form, the nature of the core may be summarized as "given the data x, values y are determined". Further, the relations of the core can be represented as formal system.

It is claimed that such relations represent dominant or persistent forces in the production system. This is partially grounded on the empirical observation that technical change is a relatively slow process, allowing an approximate constancy of technical coefficients in production over time. Therefore, analysis is set in the long-run. While the relative prices are indicative of dominant forces within the production system, they are not measures of actual prices. Rather, they are "normal prices".

From Pratten's point of view, the conception and treatment of the core by the Sraffians seems similar to deductivist methods said to be used by neoclassical theorists.

There are four main aspects of this approach to the core which are objectionable from a critical realist perspective: 1) the use of closure to bound the core, 2) the quantifying and formalizing of the relations of the core variables, 3) the determination of the magnitudes of endogenous variables through system solution, and 4) the necessity of the "analysis of the core" as the first step in a wider research exercise. These are signatures of an approach where the goal of inquiry is to discover event regularities in the form of determinate results, in this case, prices of production and a surplus level that allow production and exchange.

4.4.2 Centres of gravitation

The second organizing principle is the centre of gravitation. Although the relative prices of production and the level of surplus (or rate of profit) determined in the analysis of the core are not regarded as measures of actual values, there is the claim that these "normal values" act as centres of gravity for actual prices of production and rates of profit. Here is the explanation. The relations of the core are understood to be an underlying structural reality, a structure of "systematic, regular and persistent forces" (Milgate 1982: 34 cited in Lavoie 1992: 9). The persistent nature of these forces allows them to operate over long periods of time, thus the focus is on the long-period. Normal values determined by analysis are indicators of these forces. Therefore, inquiry must involve the determination of these values in order to study the forces. This interest in identifying underlying structural realities by the neo-Ricardians parallels the critical realist focus on revealing causal mechanisms that exist at a deep, real level.

However, in a bid to offer theoretical statements that are explanative of empirical events in the actual realm, the neo-Ricardians make some claims about the relations

between normal and actual values. These claims "can in fact be represented as a formal system within which functional relations, characterizing these dominant tendencies, obtain" (Pratten 1999: 31). A functional relationship between "normal prices" and actual prices is proposed. Actual values move toward normal values. A normal value, the centre of gravity, has the status of an equilibrium position. The process of convergence is a regularity. The force or process which operates on actual values and causes them to move toward "normal values" is competition. This is an assumption which does not appear to have much empirical grounding. Yet, competition is assumed to be the force which equalizes rates of profit across industries in the economic system (Eatwell 1982: 210-11 cited in Pratten 1999: 34).

The effect of competition in moving actual values towards normal ones is a key assumption in this theory. This assumption allows functional relations between core variables and non-core variables to be deduced. Yet no reasons are given that justify this claim. According to Pratten, the neo-Ricardians tacitly accept it. He writes:

> It remains unclear how competition or gravitation forces could guarantee that strict functional relations should characterize the system. Rather, it is merely assumed that if a system is to be amenable to scientific analysis then event regularity must exist at some level (p 34).

In summary, the centre of gravitation hypothesis features three contested claims: 1) normal values are indicators of an underlying structural reality, 2) functional relations exist between normal values and actual values where normal values act as a centre of gravitation or equilibrium position towards which actual values converge, 3) competition is assumed to operate on actual values, causing them to gravitate towards normal values.

If Pratten's characterization is a truthful representation of the method employed by the Sraffian strand, it seems obvious why the strand would appear tied to a deductivist

mode of explanation. Reliance on determinate solutions through mathematical analysis of formal models built in part on questionable assumptions is antithetical to a larger research program like post-Keynesian that is trying to move beyond deductivism and employ method suitable for open systems theorizing. This is the case against the Sraffians.

4.5 Deeper methodological deliberations

However, deeper exploration of the issue, combined with some conceptual "unpacking", finds that severing relations between the post-Keynesian school and the Sraffians on grounds of methodological incompatibility is too hasty. A confronting of critical realist principles with the practices of analysis, modeling and theorizing allows the realignment of the Sraffian research program without losing its distinctive feature of the core.

4.5.1 A review of the fundamentals of scientific inquiry

Before we consider these two issues in greater depth, we will first review some fundamental concepts used in scientific inquiry with economics in mind. Inquiry begins with a question about the nature of the thing of interest. To answer the question, the investigator performs two activities: description and analysis. Inquiry begins with the descriptive mode where the object of interest is projected in some representation, such as a model. The description allows the investigator to examine the constituent parts of the object and try to understand the relations between the parts, perhaps leading to an answer to the original question. This is the analytic phase of inquiry. The findings from analysis may inspire a revision of the initial description of the object. Also, new questions may rise from the conclusions. This extension of inquiry from the original impetus

characterizes scientific activity. The evolutionary spiral of accumulating findings marked with the collision of competing theories is driven by investigators engaged in the descriptive and analytic modes.

In addition to being a social science, economics is also a system science. Economics is about the relations between human beings engaged in production and consumption within their physical environment. The economy is a system, a group of interacting elements forming a collective entity. The scope of economic inquiry can involve the entire economic system, a lofty ambition that ultimately includes all economic activities on earth. Not surprisingly, the questions often pursued in economic research deal with part of the system. Macroeconomics, the most encompassing of economic activities among the subdisciplines, has a national focus. International economics is traditionally about the relations between national economies, rather than the world economy as a collective whole.

Depending on the nature of the question asked, the description of the object of study will involve the selection of elements that compose the system; for example, consumer, firms, and governments. Often, the investigator may select variables that characterize the system elements (e.g. the preferences of consumers, the technology of firms, the expenditures of government) and examine the relations between the selected variables. The selection of system elements and/or their characteristic variables (hereafter both are referred to as variables) followed by the organizing of these variables in some relational order constitute the descriptive mode. The representation of the object of interest is a model. Two aspects of modeling practice need to be stated. First, as the selection of variables is conditioned by the nature of the "question asked", describing the

object in model is a normative activity. The investigator can not avoid the question "why are you interested in this and not that?" Second, modeling is an exercise in abstraction. In selecting a subset of variables from a larger (perhaps unbounded) set of variables that constitute the system, those variables are abstracted away from the complexity of the concrete. There is unavoidable partiality, even in attempts to construct general representations, such as in the case of Walrasian general equilibrium.

After selection, the variables are organized in terms of their relations with one another. In economics, the quantitative character of many economic variables allows their relations to be expressed mathematically. Thus it is common to represent the relation of variables in terms of equations. The object of study may be contained in a single equation or a set of equations. A macroeconomic model may feature several "structural" equations that describe investment behavior, consumption or the relation between aggregate supply and demand.

There is a convention in mathematical representation of economic relations in equations to designate variables as either exogenous (independent, explanatory, causal or given) or endogenous (dependent). This designation is necessary for the operation of some analytic technique such as describing the properties of the relationship encapsulated in the equation or finding a solution to a system of equations. However, this assignment of the exogenous/endogenous label to the variables is problematic. In an open-systems ontology supposed by critical realists, all elements which compose the system are from within the system. None are found outside the system. All are endogenous. The economic system is endogenous to the planetary ecosystem. When an investigator makes this distinction when modeling the object, the exogenous variables acquire a functional

status within the relations among variables. The order of the relations in the model can suggest that certain variables exercise causal agency over others, although this may not be true in reality. In the answering the questions evoked in scientific research, the investigator may intend to understand the object of interest through description, through the search for associations between the elements in the model, or through identifying causal relations where variables exercise power to produce effects in other variables. The identification of causal relations may be regarded as a high epistemological achievement in science, but it is also the activity which generates the most controversy in scientific debate. As discussed earlier, the empirical realist position is typified by the search for event regularities of the form "if x, then y" as indicators of causal relations. While David Hume was skeptical of whether we could have certain knowledge about causal relations, observation of event conjunctions would suffice as a method of understanding. The other means of identifying causal relations would be through axiomatic deductive reasoning.

Critical realists, on the other hand, aim to reveal the underlying mechanisms and structures that govern the course of events, specifically relatively enduring structures and mechanisms. As Lawson point out, "over restricted regions of time-space, certain mechanisms may come to dominate others and/or shine through: non-spurious, rough and ready, partial regularities may be observed" (Lawson 1997: 204). These partial regularities, an empirical phenomenon, draw the attention of the critical realist investigator and may demand an explanation. If this "dominance" over other mechanisms suggests a subject-object causal relationship, there must be some procedure in the descriptive/analytic modes of critical realist inquiry to facilitate the revealing of such causal relations. The designation of exogenous and endogenous variables in inquiry

may be instrumental, although in a provisional sense, in revealing dominant mechanisms.

This brings us to the role of abstraction in the descriptive and analytic modes of inquiry, returning us to a topic discussed earlier in part I. Abstraction is the "focusing on certain aspects of something to the momentary neglect of others" (p 227). The focusing on a certain part of the whole in order to understand that part involves boundary setting or making a closure. Two types of abstractive closure may be distinguished. Mental or cognitive closure is a psychological act, either conscious or unintentional, by the observer. It is an action that helps the observer make sense of a complex object. Not only is cognitive abstraction an unavoidable human habit, it is indispensable in scientific investigation (Gleitman 1987: 109-238). A closure made through cognitive abstraction may also be called a provisional (epistemological) closure. It contrasts with an ontological closure which suggests a closure that exists in reality independent of mind. In the practice of inquiry, care must be taken not to confuse cognitive closures which may be made to aid inquiry and ontological closures which may be associated with a claim that closures exist.

The use of cognitive closure is a part of reasonable strategy when analyzing complex systems like economies. Lawson sees the value of abstraction in the uncovering and understanding of deeper structures and mechanisms in critical realist inquiry. In examining economic systems, abstraction involves focusing on a particular structure and its power or tendencies. The particular structure selected by the investigator is influenced by the nature of the question asked.

> In order to illuminate a structure responsible for the production of some phenomenon of interest it is necessary to identify connections and relations essential to that structure's efficacy and to its existence and mode of reproduction (Lawson 1997: 232).

This identification can result from the conscious effort of abstraction. Whether or not the identified structure is found to be the causal mechanism of the phenomenon of interest depends partially on the investigator's skillful use of abstraction.

The explicit recognition of the role of epistemological closure in economic inquiry is evident in the thought of several prominent economists. The German historicist Wilhelm Roscher recognized that it was advantageous for the researcher to "mentally isolate the factor of which for the time being, he wishes to examine the peculiar nature" (1878: 104-5). However, Roscher, being wary of the Ricardian vice of uncritical use of assumptions built through abstraction, warns that in making a closure:

> It never should be lost sight of, that such a one is only an abstraction after all, for which, not only in the transition to practice, but even in finished theory, we must turn to the infinite variety of real life (pp 104-5).

Alfred Marshall, the champion of partial closure as a tool in economic analysis, describes the principles followed by such a researcher:

> In breaking it up, he segregates those disturbing causes, whose wanderings happen to be inconvenient, for the time in a pound called Ceteris Paribus. The study of some group of tendencies is isolated by the assumption other things being equal: the existence of other tendencies is not denied, but their disturbing effect is neglected for a time (1920: 379-80).

Keynes, a student and critic of Marshall, did not abandon his teacher's ceteris paribus principle in developing his own approach to economic thinking. Keynes opposed an economic method that foresaw legitimate economic claims as only those that stem from analysis of formal systems where strict closures are assumed throughout. Rather, proper economic thinking is one where:

> In ordinary discourse, where we are not blindly manipulating but know all the time what we are doing and what the words mean, we can keep "at the back of our heads" the necessary reserves and qualifications and the

adjustments which we shall have to make later on (1936: 297).

Two post-Keynesian economists recognize the instrumental role of closure through abstraction in inquiry. Chick and Dow write that:

> The process of theorizing starts with an appreciation of the chief characteristics of the economy itself. Selection of these characteristics represents a kind of closure (2001: 714).
>
> Knowledge progresses by identifying (and justifying) subsystems which can be segmented off for special study, always bearing in the back of one's mind the ultimate interconnectedness (p 715).

For Lawson, the use of abstraction in confronting a complex reality is demanding of the investigator. This is not surprising given that economic inquiry takes place in an open system without the benefit of the contrived experimental situation. Several precautions must be kept in mind when engaging the object. While abstractions can be partial, they cannot be fictitious. An example is the behavioral assumption of the omniscient rationality of the economic agent. This is not an aspect or one side of the larger psychological character of human beings: it simply does not exist (or at least has not yet been demonstrated). This concern is evident in Lawson's critique of the "method of successive approximation" where the initial assumption in the deductive argument is an idealization which is subsequently relaxed or calibrated more toward reality (1997: 129).

A second precaution is testing the validity of any closure made. The investigator making the closure should try to measure the relative dominance of the hypothetical mechanism toward the other elements that are "out-of-focus" or outside of the closure. In other words, we should assess the extent to which the identified mechanism casts causal influence over the other elements of the system with respect to any influence these "out-

of-focus" elements exercise over the mechanism. This involves bringing back into focus what was once out-of-focus. The ceteris paribus clause is relaxed in order to see if the deduced causal influence of the mechanism continues to operate without negation by the presence of other elements. The activity of the mechanism may be obscured by the other elements. This does not render this identified mechanism as invalid. However, evidence that the mechanism is inoperative, passive or distorted when related to the larger system may cast doubt about the hypothetical relative dominance of the mechanism in that particular systemic order.

Extending from this appraisal of the closure is the rigorous appraisal of the chain of reasoning that follows from the initial closure or first step. The strategy of trying to understand a complex object consists of two broad phases: the abstracting away from the complex whole and the step-wise reconstituting of the whole with the abstracted. The reconstituting of the whole may take the form of "short chains of reasoning", an approach advocated by Marshall in order to deal with:

> Those difficulties in economic investigations which make it necessary for man with his limited powers to go step by step; breaking up a complex question, studying one bit at a time, and at last combining his partial solutions into a more or less complete solution of the whole riddle (1920: 366)

If the progressive building of a model of the economic system involves relating in a step-wise fashion the identified causal mechanism to other elements, then each relational link must be scrutinized just as the causal effects of the abstracted mechanism is appraised of their validity. Each relational link in the chain of reasoning that reconstitutes the whole is a (synthetic) provisional closure in that some elements of the system may not be included in that particular relational link (extrinsic closure) and the

elements that are featured in that relation may be "closed" by some definitional or behavioral assumptions (intrinsic closure). Here, we see both the intellectual challenge and laborious task facing of the critical realist investigator who engages the complex object. The search process for these robust underlying structures and mechanisms which, in their relational order, explain the phenomenon of interest is a search through trail-and-error. This is the labour of science. Here, the investigator exploring the object through abstraction should assume the role of Lawson's cameraman, continually zooming in and out of focus, moving from one segment of the whole to another in the search for explanatory mechanisms and robust relations. Given the absence of the controlled experimental situation in the social sphere, the task of revealing the explanatory mechanism is a greater chore for the social scientist. If the explanation involves several short chains of reasoning, it may be useful to test several permutations or variations of the order of these "chain links". Having no a priori knowledge about the position of the identified dominant mechanism in the order of elements featured in the model, the investigator must test several permutations in order to identify the probable order. This crucial phase in inquiry may have as much to do with art as science:

> The question of the order in which problems are tackled is of the utmost importance. We have no criteria about how that should be done (Chick and Dow 2001: 716).

Given the historical character of most economic phenomena of interest and that the phenomena may be re-described as narrative, seeking an explanation of what happens in the narrative may involve the testing of different scenarios or versions of what exactly happened. All this is to say that thorough practice in abstraction reduces the probability of making false claims about the causal influence of certain mechanism and the order of

relations in the model, the reconstituted whole.

The last point about abstractive practice, specifically the act of combining abstracted parts into a reconstituted whole, is the need to recognize the difference between "mechanical" and "chemical" combination. Coined by J.S. Mill, mechanical combination refers to quantitative character of the result of combining two elements. They relate in arithmetic fashion. On the other hand, chemical combination refers to the qualitative nature of the resultant. In this case, relations between two elements are not aggregative. The sum of the abstracted parts does not equal or is not identical to the whole. The recognition of an interdependent, organic social reality that in part features entities that can not be reduced to their parts make it important to distinguish between quantitative and qualitative relations between elements. The view that economic reality features only quantitative relations or that qualitative relations can be re-described as quantitative is problematic. The estrangement between neoclassical orthodoxy and the American institutionalist school is evidence of this. Also, Keynes recognized the importance of this distinction. Keynes's philosophical position, according to O'Donnell, is as follows:

> Reality is always qualitative and, depending on its nature, possibly quantitative as well, with the quantitative side comprising both ordinal and numerical magnitudes. The general presumption that the world is fundamentally isomorphic with the terms necessary for quantitative analysis is this invalid (1990: 34).

In the course of inquiry and engaging the object, the investigator must ask: to what extent can the analysis take a quantitative character? What are the limits of the use of quantitative methods in getting to know the object?

4.5.2 Reconsideration of the core

With this sketch of the practice of scientific inquiry with its critical realist considerations, we are then able to assess the case against the core as put forth by Pratten. We can see the articulation of the core as the result of Sraffa's inquiry into the reproduction of economic systems that feature the production and circular flow of commodities, a wage-earning labour force and a surplus. These features are associated with classical industrial capitalism (1750-1914). Specifically, Sraffa was searching for an invariable standard with which to measure prices, a standard independent of wage levels and surplus. To answer this question, Sraffa constructed a model on which he then performed analysis. He did not resort to empirical evidence to answer this question but through a paper-and-pencil analytic exercise.

Pratten's case against the core includes charges that the modeling strategy demonstrated by the Sraffians is reliant on a deductivist mode of thought that is antithetical to critical realism. I argue here that we can not a priori make this judgment without examining the specific details of the modeling procedure in light of some benchmark criteria. I have provided a characterization of general features of scientific practice which, while they may be observed in deductivist practice, are also characteristic of critical realist inquiry. The key distinctions are the emphasis on the testing of claims and the use of abstraction.

Three of Pratten's charges concern the modeling strategy associated with the core. The three charges are the use of closure to bound the core, the quantifying and formalizing of the relations of the core variables, and the determination of the magnitudes of endogenous variables through system solution. As discussed above, closure is a necessary and indispensable tool in confronting a complex reality, a tool that is not

prohibited to critical realist. The specification of the core in terms of 3 exogenous variables and 2 endogenous variables constitutes a closure or a locked-up or segmented subsystem. Making this closure should not immediately disqualify this inquiry from being part of open systems research. The important question is how this closure is used: is it treated as provisional cognitive closure or is it claimed to be a real closure? This will be dealt with later.

After the selection of these variables from other elements in the economic system, Sraffa specifies the relations between these variables and represents them in model form. This is the area of Pratten's second concern: the quantifying and formalizing of the relations of the core variables. This concern is likely related to the association of formalist methods with the deductivist mode of explanation. However, the latitude in description permitted by critical realist principles of abstraction described earlier would not exclude this description of the core. The variables contained in the core are quantitative variables. Further, the quantitative variables that are designated as exogenous (wages, technical coefficients, social output) are capable of measurement. Further, the variables relate to each other arithmetically. The relation between quantities of commodities in the production process is linear; they combine in some proportion. At the beginning of Chapter I in *PCMP*, Sraffa begins with an illustration of concrete relations using specific values. In this subsistence production economy, there are 3 commodities produced in 3 industries:

240 qr. wheat + 12 t. iron + 18 pigs → 400 qr. wheat
90 qr. wheat + 6 t. iron +12 pigs → 21 t. iron
120 qr. wheat + 3 t. iron + 30 pigs → 60 pigs

The realisticness of this concrete scenario is not disputed. Cost accounting of an actual

production line would feature the quantities of inputs used in the production of a certain amount of output. Inputs relate to output in an additive mode. Relations can be represented mathematically and the realisticness will not be compromised

If the quantitative character of the core variables and the claim that real arithmetic relations exist between these variables are accepted, it follows that the description of these variables and their relations can be abstracted and take a more generalized or higher nomothetic character without distorting the essence of the object. By replacing the concrete measures of values with algebraic symbols, Sraffa offers a *formal* representation of this 3-commodity economy. Here, A_a, B_a and C_a are the quantities of commodities A, B, and C used as inputs in the production of commodity A:

$$A_a + B_a + C_a = A$$

If exchange ratios or "prices" are introduced, the total value of the product A can be formally expressed as:

$$A_a p_a + B_a p_b + C_a p_c = A p_a$$

where p_a, p_b, p_c are the respective prices for inputs A_a, B_a and C_a. Adding the other two equations representing the production of commodities B and C, the 3-commodity subsistence production system is represented as:

$$\begin{aligned} A_a p_a + B_a p_b + C_a p_c &= A p_a \\ A_b p_a + B_b p_b + C_b p_c &= B p_b \\ A_c p_a + B_c p_b + C_c p_c &= C p_c \end{aligned}$$

This model can be expanded for K commodities. Although this representation is different from the original equation featuring specific quantities of pigs, iron and wheat, the essential relation between these commodities is maintained at this level of generality. In the back of our heads, we can remember that A_a can represent 240 quarters of wheat. In

this form, the concrete can be recovered from this abstracted model. So, quantification and formalization of relations in describing the core does not necessarily impede open systems inquiry.

Following from this position, it is not obvious why mathematical operations, in particular the determination of the values or magnitudes of the endogenous variables, should be excluded from analysis of the core. The argument that I make here is that if there are no objections to the form of the object's representation (its model), then there should be no a priori objections to the type of analytic tools that can be used on the model. If the object can be represented as a mathematical model without demonstration that the object has been obscured or distorted, then mathematical operations can be used to study the properties of the relations. Thus, the derivation of relative prices and the surplus though an application of linear algebra to a system of equations should not disqualify this research from being critical realist. The burden of demonstrating any claim of realism of an abstracted object takes place in descriptive mode, not the analytic mode.

It is in the descriptive mode where some issues related to Sraffa's approach arise. In Chapter II of *PCMP*, Sraffa describes a system of production with labour input and a surplus. He introduces labour input with the assumption that labour quality is uniform or has "been previously reduced to equivalent difference in quantity so that each unit of labour receives the same wage" (p 10). Therefore, the value of the labour input (Lw) in each production line is added. The other addition to the system of equations which distinguishes this economy is the surplus, represented here as the rate of profit r. The relation (1 + r) is a simplified form of an expansion that shows r as a proportional rate on

the values of the commodity inputs:

$$(A_ap_a + A_ap_ar) + (B_ap_b + B_ap_br) + (C_ap_c + C_ap_cr) + L_aw = Ap_a$$

This rate r "must be uniform for all industries" (p 6). A model of a 3-commodity production system with surplus is found below:

$$(A_ap_a + B_ap_b + C_ap_c)(1 + r) + L_aw = Ap_a$$
$$(A_bp_a + B_bp_b + C_bp_c)(1 + r) + L_bw = Bp_b$$
$$(A_cp_a + B_cp_b + C_cp_c)(1 + r) + L_cw = Cp_c$$

The development of the formal model has moved beyond the simple isomorphic abstraction examined earlier. Two new variables are added to the equations. The assumptions that define their form and relations must be considered. Depicting labour as uniform in quality in order to specify a uniform wage violates the real world feature of wage differentials across industries. The assumption of a uniform wage rate hinges on the belief that differences in labour quality can be reduced to differences in quantity given a set wage rate. While this re-description of labour input may not pose problems in the search for a standard commodity, it would create problems if the model of the core were used to examine labour productivity across industries where differences in labour quality would be an important factor.

More problematic is the depiction of surplus or profit in this model. Profit is represented in the equation not as an addition of value as in the case of labour costs but as a proportion of the value of each commodity input. The source of profit is through a uniform mark-up rate on commodity inputs. Two questions arise. The first is the truthfulness of the assumption of a uniform profit rate. Similar as the case of the wage rate, observations of the real world suggest that profit rate differentials across industries may be a more realistic description. The Sraffians justify the specification of a uniform

profit rate through the assumption that profit rates across industries do equalize in the long-run. This assumption will be discussed later.

The more fundamental question is about the choice to represent the profit as a rate. As Lawlor points out, there is a consensus across both the neoclassical and Sraffian schools that the profit variable is best represented as a rate of profit. Further, there is general agreement that the rate of profit is net income (surplus) over total invested capital (outlay) in production per time period (1994: 324). Lawlor finds that these schools share in the use of the rate of profit concept in ahistorical analyses that are closed from the examination of the system's history and the position of economic agents that have influenced the determination of the variables under consideration. While models of economic systems such as Sraffa's may reflect the creation of profit in existing industrial economies in the 18th century, the transformation of economic institutions since the era of "classical industrial capitalism" has featured the advancement of the role of financial activity in the economy system and the growth of the mega-corp. In the Sraffian model of the core, the creation of surplus value is through the uniform mark-up on production inputs. Ownership of the surplus is related to ownership of the production inputs. The influence of finance does not appear in this surplus (p 326). Some heterodox thinkers challenge this view. Lawlor cites Thorstein Veblen who observed a different economic system from the one depicted by Adam Smith and rethinks the source of profit in the contemporary capitalist system:

> First he takes explicit issue with the material concept of the 'uniform' rate of profit, arguing that what is now important in conditioning competitive capital flows is a much more expectational and immaterial 'prospective profit yielding capacity' of any given decision (p 327).

This perspective would be shared by the fundamentalist Keynesian strand which

emphasizes the importance of expectations and uncertainty in decision-making.

From a critical realist perspective, there are good reasons to question the representation of surplus as a uniform rate of profit in the model. A remedial measure would be to relax this assumption, substitute profit rate differentials in the model and examine the effect this has on the findings from analysis. Does the inclusion of differential profit rates alter the conclusions? This type of exercise reflects the critical realist to test the validity of closures made in modeling. This includes the testing of assumptions within the closure which are suspected of being fictitious rather that highly abstract.

However, the assumption of a uniform rate of profit is supported by other assumptions which are encapsulated in closures. It is assumed that the rates of profit tend to equalize in the long period. In fact, profit rate equalization is an indicator of achieving equilibrium in the long-period. Thus the Sraffian model of the core is said to represent long-period conditions. There is an implicit closure involving time. The market period and the short period (and their associated characteristics) are abstracted away from the long period. This issue of time closure will be addressed later.

The other assumption that supports this notion of surplus is that it is closed from other sources of profit, for example, profitable arbitrage during market day and capital gain through market capitalization in the short run. Given this closure, the rate of profit as it relates to material capital outlay in the production process may be interpreted as a production profit which is just one of several sources of profit that maybe realized over time. An issue with the interpretation is that it assumes that surplus from production subsystem is not related to profit obtained in any other sphere, for example, the financial

system. Such a closure would be inappropriate if there were evidence of some functional relationship between profit from production activities and financial activities.

Related to the scrutiny of issues connected to the description of the Sraffian model is the matter of how the Sraffian model or the core has been used since the publication of *PCMP*. Among the different schools that are found under the Sraffa-inspired research programme, it has been the Marxian strand led by Garegnani that has placed strong emphasis on the role of the core. In particular, this strand is distinguished by its claim that the analysis of the core serves as the first step in any larger initiative to model the economic system. In subsequent steps in modeling, elements excluded from the core would then be related to the core variables. If the justification of this order of steps in description/analysis can not be demonstrated, this methodological rule poses potential liability in successful open systems inquiry. To illustrate, the efforts by this strand to relate effective demand to the core resulted in the exclusion of exogenous determinants of investment, namely the role of "animal spirits". Animal spirits, Keynes's term for the intuitive urge to act is an aspect of human behavior related to expectations and decision-making under conditions of uncertainty. This element is a prominent feature in the work of fundamentalist Keynesians with their emphasis on the short-run.

Apart from the possible role this specification of investment had in the estrangement of the fundamentalist Keynesians and the Sraffians, there is the issue of whether or not this "core as first step" approach to inquiry is consistent with critical realist principles. Indeed, the argument has been made that in confronting complex systems, cognitive closures may be made and that the building up of robust models may take the form of "short chains of reasoning". However, the claim that the core should be

the first step requires justification. This may be accomplished by testing several specifications or permutations of the "chain of reasoning", some of which feature the core not as the first step. Through a series of re-description / analysis / verification, we will be able to attain greater insight and confidence into whether the core should be the first step.

With this series of re-description / analysis / verification of the chain of reasoning, the core itself must also be tested. Two things may be considered. First, the relative dominance of the core as a structured relationship when related to other elements of the system should be tested. Are these outside variables functions of the core? How can we observe the causal influence of the core over other variables? Second, we should investigate whether or not the core maintains it structural form when it is related to other elements. Does the cognitive closure that isolates the core dissolve when related to variables depicting money and finance, decision-making behavior, and market forms? These are questions that must be answered if the hypothesis of the core is indeed an active dominant mechanism that can explain observed stylized facts of the economic system that initiated inquiry in the first place.

4.5.3 Thoughts on time and equilibrium

4.5.3.1 Time

Earlier, we discussed what a modeling strategy following critical realist principles might involve; for example, careful attention to the use of closure and verifying chains of reasoning. We now focus on one crucial variable in the system: time. In considering the issues related to representing time in models, the related concept of equilibrium will also be examined.

A characteristic of the economic discipline's increasing sophistication in the area

of modeling and analysis has been the representation of time as a symbol t in order to include it in mathematical models along with other algebraic symbols. This reduction of time to a symbol has been necessary for description and analysis at higher levels of generality such as that found in formal models. From its commonsense meaning as a continuous flow of existence marked by events and processes, time is reduced to a point in space that represents a moment in time or a duration of time. One route for scientific inquiry is seeking the coincidence of events that share the same moment or duration. This would be the route taken in an empirical realist inquiry that searches for law-like event regularities. The task in such inquiry is twofold. First, coincidences of events must be found in the abstract theoretical. They must be demonstrated in the model. Second, empirical correspondences that reflect the theoretical correspondences must be discovered. This is the familiar two-step scientific methodology of forming a hypothesis and testing it. The problem is that the reduction of time to a point in space in the model restricts the scope of analysis to an instant. Theorizing becomes restricted to what happens at that instant to the exclusion of events before and after the instant in question. Hamouda and Price describe the obstacles posed by this representation of time:

> Since to construct causal or deterministic theories of specific event series is as yet outside the reach of the discipline (for which there is no laboratory or controlled environment for observation and experimentation, and whose studied activities are too complex to reveal unambiguous causal relations), these economists have been able to theorize only about the result of a simultaneous configuration – the state of events at *one point in time* – not about any preceding or consequent situation (1994: 428).

Attempts to construct mathematical models involving two or more moments or durations in time while continuing to represent time as points in space, say t_1 and t_2, can lead to conceptions of time quite different from that of time as a continuous flow of

existence marked by events and processes. Heterodox economists of the both Keynesian (Robinson, Shackle) and Austrian (Von Mises, Hayek) ilk have been cautious about such treatment. In the preface to her textbook, Robinson warns readers that:

> We must take time seriously. To make a comparison between two situations, each with its own future and its own past, is not the same things as to trace a movement from one to the other (1960: v).

The concern over how time is handled mathematically has led to a distinction between logical time and historical time. Historical time is a sequence of moments where the past, present and future are not necessarily identical. This implies the possibility of difference and change. It also implies the impossibility of returning to the past: time is irreversible. Historical time is the continuous flow of events and processes, the flow that we are aware of and in which we exist. Logical time is a more abstract concept, a mental construction that has no obvious correspondent in the world outside of the mind. Logical time can be imagined to be the time that elapses for a particular closed set of elements. These elements in their relational arrangement do not display any endogenous change from moment to moment. Therefore, the state of relations at any two instants is identical. It would seem, that in the absence of endogenous change, moments designated as past, present and future lose their sequential character. The closed system transcends time; it is timeless. Thus, the system is amenable to logical manipulation; for example, since past, present and future moments are identical, they can be collapsed into a single point in space. Reversibility is permitted (Henry 1993: 20).

In addition to the distinction between historical and logical time, another way in which time is handled in description is the division or segmenting of time into periods. The meaning of the time period has varied throughout the history of economic practice.

A period can represent a duration of time or a moment of time. For example, the long period in classical economics is understood to be a duration of time where structural factors exhibit a persistence or constancy. Within the long period, there may be phenomena of an ephemeral or accidental nature that are characteristic of the day-to-day economic activity such as market prices. These "surface" phenomena are inconsequential to any investigation of the structural workings of the economic system. These phenomena are relevant to inquiry in so far as it is claimed that they gravitate towards the "normal" magnitudes determined by the persistent structural forces unique to that long period. The short period was understood to be the period marked solely by ephemeral day-to-day phenomena. In a sense, the classical short period was not a period at all. Rather than seeing the long period as a series of short periods, it is the notion that long period phenomena relating to persistent structural forces could be separated in analysis from the ephemeral phenomena of the short period. In reality, both types of phenomena occupy the same chronological duration.

The marginalist revolution in the discipline brought change to the concept of time period. The focus of inquiry moved from the persistent structural factors to the forces of demand and supply as the proper starting pointing in economic investigation. In a sense, there was a methodological shift from the deep to the surface. With this shift came an innovation in the division of time. Alfred Marshall identified four time periods: the market period, the short period, the long period and the period of secular movement. We will focus just on the short period and the long period. Rather than viewing the short period as something that can be abstracted from the long period, the short period took on the connotation of duration that is intrinsically related to the long period. The short

period is the duration for which the quantity of capital and how it is organized is fixed and cannot be adjusted. The long period is the period in which the capital stock and its organization can adjust to the desired level and form. In the sense of chronological time, there is a point in time after which managers of capital are free to adjust productive capacity whereas before this point, they are constrained. The post-Marshallian conceptions of short and long periods suggest a relational link between the two periods whereas in the classical connotation, the short period was inconsequential. Marshall's re-conceptualizing of the short period has a role in shifting the focus of analysis towards the phenomena of short period and away from the long period. Such a shift of focus is evident in Keynes's thought in the *General Theory*. The two concepts have become organizing concepts and touchstones for debate in both orthodox and heterodox circles.

4.5.3.2 Equilibrium

Closely associated with the time concept is the notion of equilibrium. Equilibrium, the idea of a state of rest or balance among related variables in a specified subsystem, is argued to be a defining feature of the economics discipline beginning at least with its classical incarnation through the thought of the Physiocrats and Adam Smith (Milgate 1987:180 cited in Setterfield 1997). The notion is omnipresent in descriptions of contemporary economic method. In his introductory chapter on economic models in his popular *Fundamental Methods of Mathematical Economics*, Chiang makes the distinction between 3 types of equations used in modeling: definitional, behavioral and equilibrium.

> The third type of equations, equilibrium conditions, have relevance only if our model involves the notion of equilibrium. If so, the equilibrium condition is an equation that describes the prerequisite for the attainment of equilibrium (1984: 9).

The handbook goes on to describe various mathematical tools[23], some of which are applied in example models that presuppose the equilibrium concept. One advantage for featuring equilibrium conditions in the mathematical economic model is that they allow the analyst to obtain determinate results or solutions to the system which may form part of the findings from analysis.

Now whether the equilibrium state is a feature of real economic systems is subject for debate. Samuelson, in the preface to his 1983 enlarged edition of *Foundations of Economic Analysis*, appears to justify his belief that real economic systems do tend towards equilibrium states through an analogy to real natural systems:

> The plausibility of such a stability hypothesis is suggested by the consideration that position of unstable equilibrium, even if they exist, are transient, nonpersistent states (...) How many times has the reader seen an egg standing upon its end? (p 5).

However, he is skeptical about the ability of our economic models to demonstrate stability of equilibrium. In our failure to give representations of systems that adequately demonstrate stability, we are comforted by the likelihood that it is the variables not included in our models that ensure stability of equilibrium in the real world.

Empirically, observing states of equilibrium is not an easy task. In our contemporary advanced capitalist economies with the regular data flow from macroeconomic indicators such as GDP, the unemployment rate and the consumer price index, change is more apparent than rest. The challenge for the

[23] The sections that are featured in the textbook are static (or equilibrium) analysis, comparative-static analysis, optimization problems, dynamic analysis and mathematical programming.

investigator who approaches economic problems with equilibrium as a central organizing concept (the equilibrist methodology) is twofold. First, a model must be developed that demonstrates existence and stability of equilibrium in the theoretical sense. Second, the investigator must demonstrate a correspondence between the model's equilibrium properties and empirical evidence. Amid the complexity of empirical data, states of equilibrium must be revealed.

With the issue of real existence aside, the meaning of equilibrium itself has varied over the history of economic thought. In classical thought, the state of equilibrium is related to the structural forces whose persistence designate the long period. When market values (or positions) move toward the normal values determined by the structural forces, the system is said to be converging toward long period equilibrium. This state of equilibrium is also referred to as the steady state where market positions have adjusted to normal positions.

In neoclassical thought with its emphasis on the equilibrating process through the interaction of supply and demand in the market, equilibrium is a surface event in that actual (read market) price is indicative of equilibrium. In the general equilibrium model with its inter-related markets, the state of equilibrium is achieved when there is no excess demand. The state of equilibrium is "a situation in which there is no tendency to change" (Blomqvist, Wonnocott and Wonnacott. 1987: G8) within the system under analysis. Whereas in classical thought, achieving a state of equilibrium was associated only with the long-period, the Marshallian concept of short period led to the interest in the short period equilibrium situation, an equilibrium state where capital is fixed.

Marshall's short-period contributed to the advent of modern macroeconomics. Keynes used the short period concept to develop his theory of short-period equilibrium with unemployment which he demonstrated in the *General Theory* in 1936. The economic discourse in the interwar years became increasingly interested in matters of trend and cycle, yet persisted in relying on equilibrium as an explanatory device. To discuss economic fluctuations in an equilibrium-grounded discourse, the notion of disequilibrium state must come into play. Thus, we have a dualistic view of state of the economic system: it is either in equilibrium (rest) or in disequilibrium (adjustment). This poses an interesting issue regarding the usage of concepts. Carvalho makes the distinction between run and period where "one can define short run as the lapse of calendar time necessary for the economy to move towards short-period equilibria" (1994: 352). The run is a duration of disequilibrium that leads to a moment (of whatever duration) when the system moves into equilibrium. These durations take place within a period. I find the concepts of run and period are often used as synonyms.[24]

A brief overview of the evolution of macroeconomic thought from the inter-war years to the present find the equilibrium concept at centre stage. At the same time as Keynes was working out the *General Theory*, Friedrich Hayek was trying to explain economic fluctuations with an inter-temporal equilibrium model (Ruhl 1994:128). Hicks' IS-LM interpretation (1937) of Keynes's *General*

[24] To illustrate the confusion, my introductory economics textbook features four definition for short-run , one of which is Marshall's definition of short-period: "(1) The period before the price level has adjusted to its equilibrium. (2) The period in which the quantity of plant and equipment cannot change. (3) The time

Theory was in a general equilibrium framework and launched temporary equilibrium analysis as a research program. It was precisely this interpretation by Hicks that motivated the thought of the early post-Keynesians.

The rise in prominence of the New Classical macroeconomic school has seen the re-casting of the notion of equilibrium. Here, a model of continuous equilibrium is demonstrated where every moment is an equilibrium moment. The forces of supply and demand in the aggregate are in sync where there is no excess demand. Ruhl observes that in this model, the idea of equilibrium moves from "a position with no inherent tendency to change to a state of affairs where 'no gains from trade are left unexploited" (Ruhl 1994: 131). What enables the demonstration of continuous equilibrium is the rational expectations behavioral hypothesis which specifies that all agents in the system have the same information set and the same ability to compute this information without error or time lapse such that their decisions are mutually compatible results. Non-optimal economic fluctuations are explained by asymmetries in information.

As a model developed using the logical time concept, the implications of its conclusions are somewhat ironic. If a state of continuous equilibrium is a possible feature of real economic systems, then economic history is less eventful (i.e. marked by change due to states of disequilibrium) than we perhaps think it is. Further, the past does not matter to economic agents in the new classical model as the information set available in the present is adequate. The ideas of learning from one's mistakes or adapting in response to past disappointments are foreign in

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before equilibrium can be re-established. (4) Any brief time period" (Blomqvist, Wonnacott and Wonnacott 1987: G21).

this model because the agents do not have to dwell on the past. For Setterfield, the rational expectations hypothesis is a device that both closes the model and allows us to avoid the reality of expectations:

> The rational expectations hypothesis is therefore designed to close models and remove the independent influence of expectations, not to help us think about the possible impact that expectations might have upon economic outcomes (1997: 51).

If we accept the new classical model to be an exemplar of orthodox macroeconomic method, it may be used to explain the reaction to orthodox method in both post Keynesian thought and critical realism. In post-Keynesian thought, the critique of orthodox method began in the conversations of Cambridge circus. In particular, two keys ideas would emerge in direct opposition to their orthodox counterparts. Keynes, who was an original in using the idea of the expectations in explanation, used a notion different from the rational expectations hypothesis used in the new classical model. For Keynes, expectations were vulnerable to being unrealized. Thus, agent behavior features expectations revision. While agent expectations can be immediately adjustable, physical capital can not. This was the underlying point that Joan Robinson was intent on making beginning with her 1953-54 paper on "The Production Function and the Theory of Capital".

These two ideas can be found at the centre of an evolving world view of economic reality in post Keynesian economics, a worldview in which the notion of time goes beyond the conventional distinctions of short and long period and equilibrium is seen not as a resting point determined by structure or the regular outcome of supply and demand but as a position that is constantly being modified

by agents. In describing this emerging paradigm, we return to the observations made earlier of the correspondence between the critical realist view of social reality and evolving post Keynesian thought.

This post Keynesian approach to macroeconomic modeling emphasizes four principles:

1. History matters in that it is irreversible. Decisions made today and carried out can not be undone to allow the conditions of the moment return to those before the decision/action was made.

2. The world is marked by fundamental uncertainty in that we cannot have perfect foresight about future events and processes, not even in a probabilistic sense.

3. Human economic agents are not endowed with unlimited cognitive ability. Rather, agents display procedural rationality, "a bounded rationality, with limited capacities to acquire information, to treat information, to compute outcomes" (Lavoie 1992: 12).

4. Physical factors of production are not malleable. Capital can be adjusted in quantity and in arrangement, but this takes time. "The purpose of "malleable" capital," according to Robinson, "is to overcome the difference between the future and the past" (1973: xii), thus to eliminate the problem posed by historical time.

With these four principles, the basic features of a dynamic model can be sketched. Such a model is a sharp departure from the new classical model of continuous equilibrium. The model is set in historical time. Time is treated sequentially. In this illustration, two sequential moments are represented as t and t_{+1}. The conditions at this moment are c_t. An agent standing at moment t has a "bounded" understanding of the conditions at t, c_t. This understanding leads this agent to develop expectations about conditions at moment t_{+1}. This is symbolized as e_t:c_{t+1}. With expectations e_t:c_{t+1}, the agent makes decisions and acts at t. This

action, as well as the decisions/actions of other agents affects conditions at t_{+1}. These conditions are c_{t+1}. When the agent arrives at t_{+1}, he may find the actual condition to correspond with his expectations created at t or may find that they fall below or above. If actual outcomes c_{t+1} at t_{+1} do not equal expected conditions (e_t: $c_{t+1} \neq c_{t+1}$), this may influence this agent's formation of expectations of conditions at c_{t+2}. There are substantive effects of decision/actions by agents which change the structural conditions of the economy.

A good example is the decision to invest in real productive capacity. Imagine the community of entrepreneurs in a given economy who are considering either the purchase of additional capital to expand productive capacity, purchasing capital to begin a new commodity line or re-arranging their existing production arrangement for efficiency gains. Of the costs associated with the decision to invest, there is the fixed nature of production conditions that exist in the short-period until the next opportunity to change production conditions. Actualized investment decisions change the quantity and arrangement of fixed productive capital. The economy's productive structure (as observed in Sraffa's technical conditions) is augmented as the result of investment.

Using conventional definitions of short-period and long-period, the scenario just described shows how a decision made in the Marshallian short-period affect the conditions of the classical long-period. The long-period is not closed from the short-period. There is a reasonable argument that actual values may have a causal influence on normal values than rather actual values being a function of normal values.

This line of argument has led to proposed re-definition of time periods. Among heterodox economists, Robinson has led the rethinking of the meaning of time. She has argued that "the short period is not a length of time but the position at a moment of time" (1978: 13). Setterfield observes that Robinson complemented this with a view that long period "should be characterized as the emergent properties of the sequences of events that precede them (Setterfield 1997: 56). Together, we can understand a moment in time as featuring both a short-period position and a long-period condition. Past moments affect the character of the present in a sequential causal relationship. The condition of the present moment affects the position of the moment. The vantage point of an agent, including how that agent may perceive the future, is linked to the past. This argument is line with Marx's view of the relation between history and agency (1852: 595).

In summary, criticism of the treatment of time and the reliance on equilibrium in the orthodox modeling strategy has led some heterodox thinkers to develop an alternative strategy featuring different notions of time and equilibrium. Logical time, while providing flexibility in mathematical manipulation, is found to be disconnected from the irreversible prior cause and subsequent effect marking the real passage of time. In an alternative modeling strategy conscious of how it describes real economic systems, historical time is the proper representation of time. Related to the use of historical time, the strategy shifts descriptive focus from the distinction between short-period and long-period to emphasis on a moment in continuous time. In redefining the moment as having

both a "short-period" position and "long-period" condition, the short and long-periods are transcended, avoiding their ambiguities and restrictions.

Related to the definition of time is the issue of how human agents behave at a moment in time. The proposition put forth in the new classical macroeconomics is an agent who is capable of obtaining and processing the necessary information to ensure perfect foresight of probable outcomes. The interaction of such agents leads to mutually compatible outcomes. The passage of time is characterized by continuous equilibrium states.

Disagreement with this definition of the agent, often on grounds of realism, has led both post Keynesians and critical realists to propose a different definition of the agent, reflecting a worldview that contrasts with the orthodoxy. The agent has limited cognitive ability and faces fundamental uncertainty regarding future outcomes. Unrealized expectations of future outcomes affect subsequent expectations formation. The interaction of agents with shifting expectations can lead to actions that change the structure of the economic system that is in part constituted by the agents. The outcome is not necessarily a mutually compatible state. Thus the consequence of agents acting in the moment is a non-equilibrium state. The passage of historical time is continuous non-equilibrium where the present condition is constantly changing.

Doubt about the existence of equilibrium states in real economic systems coupled with the concern that the equilibrium concept may obscure our understanding of real systems calls into question the purpose of the equilibrium concept in modeling strategies. What role does equilibrium have in modeling

continuous time non-equilibrium economic processes in continuous time?

4.6 Reconsideration of the centres of gravitation

With this exploration of the issues of time and equilibrium in mind, we can return to Pratten's critical points about the "centres of gravitation" proposition. From the point of view of critical realism, the claim that normal values reflect an underlying structural reality is in line with the critical realist objective of inquiry: revealing the underlying real structures responsible for generating the empirical events we observe. This could be interpreted as a retroductive inference. The claim that there exists a functional relationship between normal values and actual values and that actual values gravitate toward normal values is an elaboration of this retroductive inference. The causal effects of the retroduced mechanism, the normal values, are deduced to act as centres of gravitation for actual values.

An immediate response to these claims would be to accept that a retroductive inference has been made and its effects deduced. It would be the responsibility of the investigators making this proposition to verify empirically these deduced effects and demonstrate the activity of these normal values. However, given the discussion above on the matters of time and equilibrium, there is a deeper question of how different conceptions of how the economic system works (i.e. different social ontologies) affect our understanding of causality.

The conception of the core put forward by the Sraffians is of a snapshot of a real economic system at a moment in time. The selected variables are related in a structure that is said to be relatively immutable overtime. If this model features the specification that the rate of profit is uniform, then this model is said to represent the moment of long

period equilibrium in the system.

This model of the core is closed in two ways. One, it is closed in the time dimension. On the assumption that the long period is independent of the short period, the core is closed from the short period and isolated from the perceived inconsequential phenomena of the short period (e.g. prices of market exchange, decisions of agents). This is the second closure.

The relation of these "outside" variables of the short period are relegated to subsequent steps in analysis after the magnitudes of the endogenous variables of the core are determined. In these subsequent steps of model development, efforts have been made to incorporate effective demand into the model. The restrictions posed by this modeling strategy meant that elements of the short period such as expectations, uncertainty and money could not be included. In order to address effective demand, the character of the short period had to be tamed. The short period had to appear more determinate, more ergodic. The ontological view of the economic system as reflected in this model clashed with that of the fundamentalist Keynesian strand.

This drama in the history of economic thought unfolded in the aftermath of the Cambridge capital controversies. As Mirowski chronicles, the Cambridge, U.K. group branched out in two directions. The Sraffian group sought to re-establish the classical meaning of equilibrium in method while "the other branch, associated with Joan Robinson and the post-Keynesians, insisted that neoclassical theory was unable to describe how an economy ever got into an equilibrium because it had abstracted away from the actual passage of historical time" (1989: 349). The question for the Robinson-led group was how to handle time appropriately in modeling. The resulting ontological

position that has been articulated specifies a reciprocal relationship between agency and structure in the context of historical time. Agents form the structure yet are formed by the structure. The illustration of investment decisions by expectation-forming agents and their consequences on the technical conditions of the productive system which in turn influence expectations reflects this ontological position. The problems posed by the short period /long period distinction are transcended. This perspective finds correspondences in the philosophical thought of both Keynes and Marx. More significantly, it shares common ground with the critical realist position elaborated upon earlier.

This alternative approach poses a challenge to the Sraffian modeling strategy. While the "centre of gravitation" proposition may still be a candidate for verification, the proposition is not consistent in the ontological framework proposed by the Robinson group. The notion of centre of gravitation would have to be dropped. Normal values could be reinterpreted as shifting value vectors.

This brings us to the third claim about the role of competition. It is assumed that the systemic force or process that causes actual values to gravitate toward normal values is competition. Yet the competition element is not included in the core. We do not see how competition acts on the core variables. The force is just assumed to exist exogenously. As the model is set in the classical long period, it is closed from dynamics of competition. Just as normal values of the long period are assumed to be centres of gravitation for actual values in the short period, competition is assumed to operate across the short period and cause profit rates to equalize across industries in the long period. This raises questions about the dynamics of competition over time. Is it assumed to be constant or variable? Does the competitive force fluctuate over time? Does the force

fluctuate more in certain industries than in others? It would seem that barriers to entry and industrial concentration would affect the flow of capital across industries across time and thus the profit rates to equalize.

While the Sraffians do not appear to offer any empirical evidence to ground this claim, empirical studies by Glick and Ehrbar suggest that there is evidence, albeit weak, that the force of competition does act on industrial profit rates, causing them to converge in the long run before they are interrupted by downturns in the business cycle (Glick 1994: 42). Further, they found that "the interaction of many markets, each of which reacts with a different speed, may make this adjustment process a very complex one" (Glick and Ehrbar 1990: 161) Clearly, dynamics of competition and industrial profit rates are far from being a non-issue.

Given its variable character as a process operating over time, it would appear that the force of competition could be studied in the same agency-structure framework set in historical time as the activity of investment decision-making by firms. In focusing on the activities of the firm, we see the decision to invest in real capital as one of many decisions that compose the business strategy of a firm, a firm that is not only interested in expanding capacity to take advantage of perceived profit opportunities but also protect its market share from competitors. The effects of strategic decision-making by firms engaged in production operating under conditions of fundamental uncertainty (Dunn 2001) not only affect the technical conditions of production but also the pattern of ownership and management of capital. Here, we see a correspondence with the Sraffian research approach led by Sylos Labini. This "school" is interested in the developmental process that is influenced by different market forms (i.e. variation in industrial

organization) and the role of market forms in the division of labour and the process of accumulation (Roncaglia 1991: 204-7). Differences in the rate of profit across industries are phenomena that draw the interest of investigators in this approach.

To conclude, it appears that a Sraffian research program that defines itself by its commitment to the proposition of centres of gravitation operationalized by competition faces obstacles in a agency-structure ontological framework set in historical time.

4.6 The verdict

4.6.1 Compatibilities

This examination of Pratten's critique of the Sraffian research program in terms of this compatibility with a critical realist-oriented post-Keynesian economics has found mixed conclusions. On the positive side, an argument was made that the use of quantitative formal modeling and mathematical analysis in inquiry does not necessarily mean that inquiry is following a deductivist strategy. It was demonstrated that such methods can be used provided that the object under study can be represented in such a way without compromising essential features of the object. This involves the matter of how the object is handled in abstraction. Describing a production system in terms of a set of linear equations is argued to be an appropriate abstraction. What was found to be problematic was the inclusion of definitions in the model that suggest an unrealistic assumption. Such is the case of the uniform rate of profit assumption. But in general, the use of formal methods by Sraffa in identifying the core makes a good case for "blackboard retroduction"[25] and that mathematical methods should not be dropped from

[25] By "blackboard retroduction", I refer to the exploration of relations through mathematical practice with the view that a structure or mechanism may be identified though pencil-and-paper work. The term "blackboard" is an adjective used by McCloskey (1994) to describe the mode of theorizing that non-empirical economist engage in.

the critical realist economist's tool box. Such tools can be used in trying to identify underlying structures and mechanisms, which is an aim of the Sraffian project.

4.6.2 Unresolved differences

Issues that were found to be problematic included the reliance of certain unverified claims such as the uniform rate of profit, centres of gravitation and the causal effects of competition. When such definitions are used in describing the object, in building a model, doubt arises about the truth in the representation. In addition, certain claims about the correct approach to investigate the object (in this case, the production system) suggest an orthodoxy that restricts the flexibility of the investigator in revealing the hidden structures and mechanisms. Strict closure of the core and the primacy of the core as the first step in an analysis are examples of the orthodoxy of method associated with the research program. If these features are the hallmarks of this Sraffian approach, then finding common ground with critical realist-principled inquiry will prove difficult. Roncaglia recognizes the dilemma:

> Many aspects of Garegnani's contributions are useful for the reconstruction of political economy, provided his thesis of a supremacy of the relations analysed within the 'core' in comparison to those external to it is abandoned (1991: 211).

4.6.3 A way forward

If the approach related to the analysis of the core with the reliance on such organizing concepts and assumption such as centres of gravitation and uniform profit rate can be set aside, does anything remain in the Sraffian research program that could contribute to other post-Keynesian initiatives, in particular including ones following critical realist principles. I argue yes. Here, I will demonstrate that there is a role for

concepts and analytic tools developed in Sraffian political economy in a research approach that is organized along the Robinsonian principles described earlier.

Using the concept of the core as a snapshot of an economic system at moment in time, the snapshot must be recast in historical time. If a series of "snapshots" in interval sequence is obtained, the dynamics of the system over time can be observed as one would watch a "motion picture". This model could be constructed in a formal model with a historical time specification (i.e. conditions in interval t_{+2} are not independent of conditions in t_{+1}). Theoretical simulations could be performed. The relations of the core are also capable of empirical estimation. National accounting agencies in most advanced capitalist economies publish input-output tables from which one can derive technical coefficients. Along with measures of wages and output by industry, empirical estimates of surplus and relative prices can be calculated. The exogenous measures featured in this snapshot represent the actual outcomes of a given production interval; for example, a national accounting year. The industry profit vector that is calculated has a residual status. It should correspond to actual estimates of profit that are independently measured.[26]

The reason why the wage vector is treated exogenously is grounded on the following assumption. At the beginning of the annual production period, labour is hired or contracted to produce a certain level of output in that commodity line for that year. This level of output is set by the managers of production who expect that purchases of their output will result in an annual target level of profits. If the managers are unable to sell their output such that actual profits are lower than target profits, this disappointment

may affect their expectations of output-profit levels in subsequent production years. The managers are in a position[27] to decide whether to maintain or reduce the intended output level in the following year. The decision to reduce the intended output level will mean less labour is hired for the next production period. Here, we see the relationship between expectations, uncertainty, effective demand and labour demand.

In addition to the decision about the number of workers to hire for the coming production periods, the managers of the firm also face decisions about investment expenditures on fixed capital in the following period. Facing a future tinged with uncertainty, the decision-makers have several options related to that particular production line:

1) purchase replacement capital without increasing capacity.
2) augment the fixed capital stock to increase capacity. This suggests continued optimism about future outcomes despite disappointment in the present.
3) purchase fixed capital goods that are required in reorganizing the production technique. Reorganizing may lead to efficiency gains without expanding capacity.
4) do not purchase replacement capital and allow the capital stock to depreciate, causing capacity to fall. In other words, operate equipment until it stops working.
5) cease production activity and sell the capital stock.

Another scenario is where managers experience better-than-expected outcomes may lead to decisions to augment the capital stock to take advantage of a perceived profit opportunity. This decision will involve a change in the flow of capital goods to that firm from other industries. The change in flow could be quantitative in that the amount of capital goods purchased increases or it could be qualitative in that new types of capital goods are procured. Consider the effect on flows by a "large capital project" initiated to

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[26] If the derived profit vector does not correspond to the measured industry profit measures, then this is "contrastive demi-regularity" that should provoke further investigation. Questions about sources of profit and accounting conventions would be starting points.

[27] Using the Robinsonian terminology, I would write: the managers are *at a short-period position* at that moment when they make a decision.

take advantage of a perceived profit opportunity. This would lead to a spike in fixed capital expenditure by the firm in the production year and perhaps in subsequent years.

All of this illustrates that investment decisions by firms affect the flow of capital goods within the system. At an aggregate level, one can observe the effects of numerous investment decisions by firms through changes in industry technical coefficients in the input-output table from year to year. The possibility of changes in technical coefficients, output levels (the points of effective demand) and wage bills from year to year suggest that the derived relative prices are also subject to change. A question rises about the direction of causality between actual prices observed by decision-makers (which may influence investment decision) and relative prices. It will not be answered here. However, relative prices can be reinterpreted as shifting price vectors, indicating both magnitude and direction conditional on the technique, effective demand and wage/profit relations at that moment. If one is able to observe sets of relative prices over several years, one may be able to detect some patterns in the transforming economic system.

This discussion of an alternative treatment of the variables of the core shows a situation where variables outside the core (e.g. expectations, investment decision, and labour demand) are related to and in fact influence these core variables. In our discussion of investments decisions, we see how the core of the production sub-system may be linked to the financial sub-system. For example, the demand for loans to pay for real capital purchases and the choice between purchases of fixed capital and portfolio investment are two phenomena which impact both spheres. Further, in assembling a time series of core variable estimates, one is able to examine the relations between core variables over time (e.g. wage and profit by industry) as well as the nature of a variable to

itself over time (e.g. wages at t_{+1} and t_{+2}). All of these research possibilities point beyond traditional static analysis.

Fortunately, there is work already existing in the "literature" that would complement the new research approach to the Sraffian core being outlined here. Some dissident Sraffians identify prices of production (i.e. relative prices) with administered full-cost prices. Also, relative prices can be determined in models featuring a vector of unequal yet stable rates of profit (Lavoie 1999b:1096-7). Such advances in modeling the core help address realist concerns.

A promising development in the method of description/analysis of economic systems in historical time is the analysis of the traverse. The traverse is the path between two points that represent states of an economy. In the historical time sense, it is a transition path of an economic system in motion. Points along the traverse represent adjustments of capital and labour in response to new conditions (Lavoie 1999c: 1182-3). Thus, there is a link with expectations and effective demand. Traverse analysis is able to avoid the short period/long period distinction. It is also capable of exploring relations between actual and normal values. In the model of the traverse, causality runs from actual values to normal values. Lavoie argues that:

> Actual values during the traverse influence the definition of long-period positions, it being understood that economies are usually in transition rather than at these long-period positions and that these long-period positions are constantly being modified (Lavoie 1999b:1098).

Traverse analysis implicitly draws a connection between historical time and path dependency in economic system. Equilibrium is redefined from being a fixed point towards which a system moves to a directional tendency that is formed in the moment yet subject to change in the next.

> The end result of the process cannot be determined without knowing how the traverse proceeds. Reaction parameters of the dynamic adjustments that occur in the short period thus help to determine the new normal position. The equilibrium is path determined (Lavoie 1999c: 1184).

The conditions of the core are reinterpreted as outcomes from an accounting period. This data show where the economy is and where the economy *may* go. The idea that core data may indicate how the system is transforming only makes sense when making reference to the core data of preceding production periods. Trends in the data may suggest some relative constancy of relations in a bounded time-space context. In other words, patterns in the core data constitute demi-regularities suggestive of some enduring structure. The original characterization of the core as a snapshot of the economy is now reinterpreted as a "signpost along the traverse".

This view of the core and its possible integration into traverse analysis finds similarities in the work of another post-Keynesian economist. In recognizing the social world as an open system, Setterfield (2000) offers an example of open systems modeling. In constructing his model of a dynamic macroeconomy set in historical time featuring expectations and endogenous money, Setterfield rejects the equilibrist methodology yet retains the equilibrium concept. His retention of the equilibrium concept is to allow determinate results from analysis, results which may have some analytic value. His goal is "to deduce certain generic properties of the evolution of an open system stemming from given initial conditions" (p 83). The challenge is in the handling of exogenous variables that need to be specified as endogenous in the model to allow system solution. In Setterfield's view of the economy, decision-making behavior towards investment cannot be fully endogenized due to the animal spirits, thus preventing the model from being closed. To close the model, he uses a "synthetic closure", a cognitive closure

where part of the system is temporarily locked-up without ignoring. Earlier, it was argued that this synthetic closure device is a useful tool in critical realist inquiry. So, if long-period expectations are defined as constant in the model, an equilibrium solution can be found. This type of model is similar to Keynes's model of stationary equilibrium (Kregel 1976: 215). However, if the model is specified to allow the revision of long-period expectations over time, then it changes to a model of shifting equilibrium. While determinate solutions are not longer possible,

> it is not impossible to characterize the motion of the system over time, as long as we content ourselves with generic descriptions of its possible trajectories as a substitute for a closed-form solution for the value of nominal income (Setterfield 2000: 90).

This model of shifting equilibrium is similar to the analysis of the path-dependent properties of the traverse. In order to find values that signifies the shifting of long-period expectations, values that are used as synthetic closures, Setterfield suggests looking to conventions as closure devices, conventions represented in "stylized facts, empirically grounded assumptions and the descriptive realism of economic theory" (Setterfield 1997: 12).

This recommendation underscores the need for empirical research. The search for stylized facts or demi-regularities contributes to the quest of understanding the evolution of an economic system that is inherently open. As discussed earlier, statistical measures of the exogenous variables of the core can allow relative prices and the rate of profit to be derived. Examination of these values with estimates of other economic variables (e.g. intended investment plans, actual investment expenditure, and producer price indices) may find some relations of relative endurance over time. Extending McCloskey's belief that economists need to do more empirical work and ask "how large is large?" when

discussing magnitudes (1994: 145), post-Keynesian economists should ask "how long is long?" Some see this as a trivial point. Godley asks "is the long-run 5 or 2000 years?" (Godley 1983:157 cited in Hamouda and Harcourt 1988:31) when discussing the necessary role of real demand for the expansion of real output at any moment in time. However, this should not discourage empirical work.

To conclude, elements of the Sraffian research program can be maintained in an open systems framework set in historical time, providing centres of gravitation and uniform profit rates are set aside. I argue that the concept of the core could fit into traverse models or models of shifting equilibrium. For example, the core could be interpreted as an indicator of actual outcome and conditional direction, a "signpost along the traverse" in studying the trajectory of the evolving system. While this recasting of the core may hold some promise in a critical realist-grounded post-Keynesian inquiry into the production sub-system, the limits of such an approach is recognized. Focus on the circulation of commodities over time is only half the story, stopping in the national income and expenditure accounts. Only when it is linked to the financial sub-system with its emphasis on the circulation of money will the model of the larger economic system become more complete. Finally, while the core is found to be amenable to formal treatment in the production sub-system, it does not follow that this quantitative model of description and analysis will be appropriate in expanding the investigation of structures and mechanism of the economy. In other words, quantitative analysis of the core will need to take pace side-by-side with institutional inquiry in a qualitative mode.

5 Conclusion

Among the explanations that address the perceived explanatory failure of mainstream economics, the explanation offered by critical realism looks beyond the level of substantive theory to the level of methodology. Critical realism argues that the superficial ontological view of the economic world held by the orthodoxy influences methodological practices, practices that are not conducive to successful explanations of economic reality. The ontological position of critical realism recognizes a deeper, unobserved realm which features structures and mechanisms that are responsible for generating the economic phenomena that we observe. Recognition of this ontological perspective infers a belief that reality is an open system. Following from this is a reconstruction of methodological practice. Features that distinguish it from orthodox procedure are the role of retroductive inference, the use of demi-regularities, its approach to abstraction, the assessment of the realism of hypotheses, the selection of theory and the epistemic status of CR-grounded explanations.

Schools of economic thought can be distinguished by their vision of the world and their associated methods. It has been shown that the mode of thought which characterizes the post-Keynesian school is similar in its ontological and epistemological features as critical realism. The proposition that the post-Keynesian school recognize critical realism as its philosophical foundation comes at a time when post-Keynesians are exploring the ways in which the school offers coherency. Efforts to achieve coherency at the level of substantive theory through synthesis is a controversial enterprise in a school that sees substantive pluralism as an advantage. Even appeals to realism do not necessarily settle disagreements when the parties involved have different definitions of

realism. A promise of critical realism for post-Keynesianism is the creation of methodological plane on which differences in substantive theory can be addressed. A greater awareness of methodological issues among post-Keynesians would facilitate exploration of these sources of division.

An immediate issue that is being explored on this plane is the relationship of the Sraffian strand to the larger post-Keynesian school. This issue has existed since the 1980s when differences between the Sraffian strand and the fundamentalist Keynesian strand were expressed in substantive terms. More recently, post-Keynesians who subscribe to the critical realist position have argued that the Sraffian strand displays reliance on deductive formal methods that presuppose a closed system reality. Since the Sraffian strand appears to have more in common with the orthodoxy in their philosophical orientation, it was suggested that the post-Keynesian school and the Sraffian strand part company.

This situation is an example where the methodological exploration advocated by Dow should be used. Using the critical realist procedural framework outlined in section one, combined with the exploration of the concepts of time and equilibrium, the case of the Sraffian research program was assessed. Only the research approach displayed by the dominant Sraffian school led by Garegnani was considered. The conclusion is that the Sraffian concept of the core could be maintained in a modeling strategy that features historical time, agency, expectations and uncertainty. Such a modeling strategy is consistent with critical realist principles. However, the concept of the centre of gravitation would need to be either put aside or reinterpreted as a shifting vector in an agency-centred macroeconomic model. The assumptions of uniform profit rates and

competition must also be put aside until it can be demonstrated that these assumptions are features of the real economic system. In the meantime, a research strategy featuring elements of the Sraffian approach that is also consistent with critical realist principles has been articulated. This provides an argument that severing ties with the Sraffian strand is not necessary in a post-Keynesian economics grounded on critical realism.

6 References

Arestis, P. (1992) *The Post-Keynesian Approach to Economics: An Alternative of Economics Theory and Policy*. Aldershot: Edward Elgar.

Arestis, P., Dunn S. and Sawyer, M. (1999) "Post-Keynesian Economics and its Critics" *Journal of Post Keynesian Economics*. 21(4): 527-549.

Arestis, P. and Sawyer, M. (eds) (1994) *The Elgar Companion to Radical Political Economy*. Aldershot: Edward Elgar.

Backhouse, R. (1988) "The Value of Post Keynesian Economics: A Neoclassical Response to Harcourt and Hamouda" *Bulletin of Economic Research*. 40(1): 35-41.

_____ (1997) *Truth and Progress in Economic Knowledge*. Aldershot: Edward Elgar.

Backhouse, R. (ed) (1994) *New Directions in Economic Methodology*. London: Routledge.

Baert, P. (1996) "Realist Philosophy of the Social Sciences and Economics: A Critique" *Cambridge Journal of Economics*. 20: 513-522.

Becker, G.S. (1964) *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. New York: Columbia University Press.

Bernard, H.R. (1994) *Research Methods in Anthropology*. 2nd ed. Thousand Oaks: Sage.

Blaug, M. (1992) *The Methodology of Economics, or How Economists Explain*. 2nd ed. Cambridge: Cambridge University Press.

_____ (1994) "Confessions of an Unrepentant Popperian" in Backhouse, R. (ed) (1994) pp. 122-129.

_____ (1998) "Disturbing Currents in Modern Economics" *Challenge*. May-June.

Blomqvist, A., Wonnocott, P. and Wonnocott, R. (1987) *Economics*. 2nd Canadian Edition. Toronto: McGraw-Hill Ryerson.

Bose, A. (1975) *Marxian and Post-Marxian Political Economy*. Harmondsworth: Penguin Books.

Boylan , T.A. and O'Gorman, P.F. (1999) "Critical Realism and Economics: A Causal Holist Critique" in Fleetwood (ed) 1999.

Brown, A. (2000-01) "A Comment on Dow's "Post Keynesianism and Critical Realism: What is the Connection?"" *Journal of Post Keynesian Economics*. 23(2): 349-55.

Bush, P.D. (1999) "Pragmatism" in O'Hara, P.A. (ed) 1999: 895-7.

Caldwell, B. (1982) *Beyond Positivism: Economic Methodology in the Twentieth Century*. London: Allen and Urwin.

_____ (1989) "Post-Keynesian Methodology: An Assessment" *Review of Political Economy*. 1(1):43-64.

_____ (1998) "Review of *Truth and Progress in Economic Knowledge* by R. Backhouse" *Journal of Economic Literature*. 36(3): 1522-4.

Carvalho, F. (1994) "Short Period" in Arestis and Sawyer (eds) 1994: 350-3.

Chiang, A. (1984) *Fundamental Methods of Mathematic Economics*. 3rd ed. New York: McGraw-Hill.

Chick, V. (1995) "Is There a Case for Post Keynesian Economics?" *Scottish Journal of Political Economy*. 42(1): 20-36.

Chick, V. and Dow, S.C. (2001) "Formalism, Logic and Reality: A Keynesian Analysis" *Cambridge Journal of Economics*. 25: 705-721.

Ciccone, R. (1994) "Surplus Approach" in Arestis and Sawyer (eds) 1994: 389-93.
Collier, A. (1998) "Critical Realism" in Craig, E. (ed) *The Routledge Encyclopedia of Philosophy*. Vol. 2. London: Routledge. 720-2.
Davidson, P. (1972) *Money and the Real World*. London: Macmillan.
_____ (1992) *International Money and the Real World*. New York: St. Martin's Press.
Derrida, J. (1976) *Of Grammatology*. G.C. Spivak (trans). Baltimore: John Hopkins University Press.
Dow, S.C. (1985) *Macroeconomic Thought: A Methodological Approach*. Oxford: Basil Blackwell.
_____ (1990a) "Beyond Dualism" *Cambridge Journal of Economics*. 14: 143-57.
_____ (1990b) "Post Keynesianism as Political Economy: A Methodological Discussion" *Review of Political Economy*. 2(3): 345-58.
_____ (1999) "Post Keynesianism and Critical Realism: What is the Connection?" *Journal of Post Keynesian Economics*. 22(1): 15-33.
_____ (2000-01) "Brown's Comment: A Reply" *Journal of Post Keynesian Economics*. 23(2): 357-60.
Downward, P. (1999) *Pricing Theory in Post Keynesian Economics: A Realist Approach*. Cheltenham, UK: Edward Elgar.
Dunn, S.C. (2000) "Wither Post Keynesianism?" *Journal of Post Keynesian Economics*. 22(3): 343-364.
_____ (2001) "Uncertainty, Strategic Decision-Making and the Essence of the Modern Corporation: Extending Cowling and Sugden" *The Manchester School* 69(1):31-41.
Eatwell, J. (1982) "Competition" in Bradley, I. and Howard, M. (eds) *Classical and Marxian Political Economy*. London: Macmillan. 210-211.
Eichner, A.(1979) *A Guide to Post-Keynesian Economics*. New York: M.E. Sharpe.
_____ (1982) "La Théorie Post-Keynésienne et la Recherche Empirique" *L'Actualité Économique*. 58(1-2): 223-47.
_____ (1986) *Toward a New Economics: Essays in Post-Keynesian and Institutionalist Theory*. New York: M.E. Sharpe.
_____ (1987) *The Macrodynamics of Advanced Market Economies*. New York: M.E. Sharpe.
Eichner, A. and Kregel, J.(1975) "An Essay on Post-Keynesian Theory: A New Paradigm in Economics" *Journal of Economic Literature*. 13(4):1293-1311.
Ekelund, R.B., Jr. and Hébert, R.F. (1990) *A History of Economic Theory and Method*. 3rd ed. New York: McGraw-Hill.
Feynman, R. (1965) *The Character of Physical Law*. London: British Broadcasting Corporation.
Fleetwood, S. (ed) (1999) *Critical Realism in Economics: Development and Debate*. New York: Routledge.
Fontana, G. and Gerrard, B. (2002) "The Future of Post Keynesian Economics" Unpublished working paper.
Friedman, M. (1953) "The Methodology of Positive Economics" in *Essays in Positive Economics*. Chicago: University of Chicago Press.
Galbraith, James K. (2000) "How the Economists Got It Wrong" *The American Prospect*. 11(7).

Garegnani, P. (1966) "Switching Techniques" *Quarterly Journal of Economics*. 80(4): 554-67.
_____ (1970) "Heterogeneous Capital, the Production Function and the Theory of Distribution" *Review of Economic Studies*. 37: 407-36.
_____ (1978a) "Notes on Consumption, Investment and Effective Demand: Part I" *Cambridge Journal of Economics*. 2: 335-353
_____ (1978b) "Notes on Consumption, Investment and Effective Demand: Part II" *Cambridge Journal of Economics*. 3: 63-82
Gehrke, C. and Lager, C. (1999) "Sraffian Political Economy" in O'Hara (ed) 1999: 1090-5.
Gleitman, H. (1987) *Basic Psychology*. 2nd ed. New York: W.W. Norton and Co.
Glick, M. (1994) "Competition, Antitrust and Beyond" in Arestis and Sawyer (eds) 1994: 38-43.
Glick, M. and Ehrbar, H. (1990) "Long-Run Equilibrium in the Empirical Study of Monopoly and Competition" *Economic Inquiry*. 28(1): 151-62.
Godley, W. (1983) "Keynes and the Management of Real National Income and Expenditure" in Worswick, D. and Trevithick, J. (eds) *Keynes and the Modern World*. Cambridge: Cambridge University Press. 135-56.
Gujarati, D.N. (1995) *Basic Econometrics*. 3rd ed. New York: McGraw-Hill.
Hammond, J.D. (1990) "McCloskey's Modernism and Friedman's Methodology: A Case Study with New Evidence" *Review of Social Economy*. 48(Summer): 158-71.
Hamouda, O. and Harcourt, G.C. (1988) "Post-Keynesianism: From Criticism to Coherence?" *Bulletin of Economic Research*, 40(1):1-33. [Reprinted in J. Pheby (ed), *New Directions in Post Keynesian Economics*. Aldershot: Edward Elgar, 1989]
Hamouda, O. and Price, B.B. (1994) "Time" in Arestis and Sawyer (eds) 1994: 424-9.
Harcourt, G.C. (1994) "Capital Theory Controversies" in Arestis and Sawyer (eds) 1994: 29-34.
Henry, J. (1982) "Les Méthodes Post-Keynésiennes et l'Approache Post-Classique" *L'Actualité Économique*. 58(1-2): 18-60.
_____ (1991) *La Théorie du Commerce Extérieur dans le Temps Historique*. Paris: Presses Universitaires de France.
_____ (1993) *Post-Keynesian Methods and the Post-Classical Approach*. International Papers in Political Economy. Department of Applied Economics, University of East London and School of Economics and Business Studies, University of Leeds. 1(2)
Hicks, J.R. (1937) "Mr. Keynes and the Classics: A Suggested Interpretation" *Econometrica*. 5: 147-59.
Hodgson, G. (1989) "Post Keynesian and Institutionalism: The Missing Link" in Pheby (ed) 1989: 94-123
Howard, M.C. (1994) "Profits" in Arestis and Sawyer (eds) 1994: 315-9.
Hoppe, H. (1999) "Foundationalism and Anti-Foundationalism" in O'Hara (ed) 1999: 367-9.
Kaldor, N. (1957) "A Model of Economic Growth" *Economic Journal*. 67: 591-624.
_____ (1985) *Economics without Equilibrium*. Cardiff: University College Press.

Keynes, J. M. (1936) *The General Theory of Employment, Interest and Money*. San Diego: Harvest/Harcourt.
King, J.E. (1999) "Post-Keynesian Political Economy: History" in O'Hara (ed) 1999: 880-3
Koopmans, T. (1957) *Three Essays on the State of Economic Science*. New York: McGraw-Hill.
Kregel, J. (1973) *The Reconstruction of Political Economy*. New York: John Wiley and Sons.
_____ (1976) "Economic Methodology in the Face of Uncertainty: The Modelling Methods of Keynes and the Post-Keynesians" *Economic Journal*. 86: 209-25.
_____ (1993) "Review of *The Post-Keynesian Approach to Economics* by P. Arestis and *Foundations of Post-Keynesian Economic Analysis* by M. Lavoie" *Economic Journal*. 103(420): 1314-6.
_____ (1994) "Effective Demand" in Arestis and Sawyer (eds) 1994: 114-9.
Kuhn, T.S. (1962) *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
Kurz, H. (1994) "Value" in Arestis and Sawyer (eds) 1994: 462-7.
Lavoie, M. (1992) *Foundations of Post-Keynesian Economic Analysis*. Aldershot: Edward Elgar.
_____ (1999a) "Post-Keynesian Political Economy: Major Contemporary Themes" in O'Hara (ed) 1999: 883-7.
_____ (1999b) "Sraffian and Post-Keynesian Linkages" in O'Hara (ed) 1999: 1095-8.
_____ (1999c) "Traverse" in O'Hara (ed) 1999: 1182-5.
Lawlor, M.S. (1994) "Rate of Profit" in Arestis and Sawyer (eds) 1994: 324-8.
Lawson, T. (1994a) "A Realist Theory for Economics" in R. Backhouse (ed) *New Directions in Economic Methodology*. London: Routledge, 1994.
_____ (1994b) "The Nature of Post Keynesianism and its Links to Other Traditions: A Realist Perspective" *Journal of Post Keynesian Economics*. 16(4): 503-38.
_____ (1997) *Economics and Reality*. London: Routledge.
_____ (1999a) "Developments in Economics as Realist Social Theory" in Fleetwood (ed) 1999: 1-20.
_____ (1999b) "Connections and Distinctions: Post Keynesianism and Critical Realism" *Journal of Post Keynesian Economics*. 22(1): 3-14.
Lee, F.S. (2000) "The Organizational History of Post Keynesian Economics in America, 1971-1995" *Journal of Post Keynesian Economics*. 23(1): 141-62.
Levhari, D. and Samuelson, P. (1966) "The Nonswitching Theorem is False" *Quarterly Journal of Economics*. 80(4): 518-9.
Marshall, A. (1920) *Principles of Economics*, 8th ed. London: Macmillan. 366. [Reprinted in Ekelund and Hébert 1990: 379-80]
Marx, K. (1852) "The Eighteenth Brumaire of Louis Bonaparte" in *The Marx-Engels Reader*. Tucker, R.C. (ed). 2nd ed. New York: W. W. Norton & Co., 1978. 594-617.
McCloskey, D.N. (1994) *Knowledge and Persuasion in Economics*. Cambridge: Cambridge University Press.
_____ (1995) "Metaphors Economists Live By" *Social Research*. 62(2): 215-237.

McKenna, E.J. and Zannoni, D.C. (2000-01) "Post Keynesian Economics and Nihilism" *Journal of Post Keynesian Economics*. 23(2): 331-47.
Mearman, A. (2002) "To What Extent is Veblen an Open-Systems Theorist?" *Journal of Economic Issues*. 36(2): 573-80.
Milgate, M. (1982) *Capital and Employment*. London: Academic Press.
_____ (1987) "Equilibrium: Development of the Concept" in Eatwell, J., Milgate, M. and Newman, P. (eds.) *The New Palgrave, A Dictionary of Economics*. London: Macmillan. 180.
Miller, D.W. (1999) "Popper, Karl Raimund" in R. Audi (ed) *Cambridge Dictionary of Philosophy*. 2nd ed. Cambridge: Cambridge University Press. 722.
Mirowski, P. (1989) *More Heat Than Light*. Cambridge: Cambridge University Press.
Morroni, M. (1994) "Costs of Production" in Arestis and Sawyer (eds) 1994: 52-7.
Niiniluoto, I. (1999) "Covering Law Model" in R. Audi (ed) *Cambridge Dictionary of Philosophy*. 2nd ed. Cambridge: Cambridge University Press, 1999: 190-2.
Norrie, K. and Douglas O. (1991) *A History of the Canadian Economy*. Toronto: Harcourt Brace Jovanovich Canada.
O'Donnell, R.M. (1990) "Keynes on Mathematics: Philosophical Foundations and Economic Applications" *Cambridge Journal of Economics*. 14: 29-47.
O'Hara, P.A.(ed) (1999) *Encyclopedia of Political Economy*. New York: Routledge.
Osborne, R. (1992) *Philosophy for Beginners*. New York: Writers and Readers Publishing Inc.
Park, M-S. (1994) "Long Period" in Arestis and Sawyer (eds) 1994: 249-55.
Pasinetti, L. (1966) "Changes in the Rate of Profit and Switches in Technique" *Quarterly Journal of Economics*. 80(4): 503-17.
_____ (1974) *Growth and Income Distribution: Essays in Economic Theory*. Cambridge: Cambridge University Press.
Peter, F. (2001) "Rhetoric vs Realism in Economic Methodology: A Critical Assessment of Recent Contributions" *Cambridge Journal of Economics*. 25: 571-589.
Pheby, J. (ed) (1989) *New Directions in Post-Keynesian Economics*. Aldershot: Edward Elgar.
Prasch, R. (1996a) "Review of *Foundations of Post-Keynesian Economic Analysis* by M. Lavoie" *Review of Political Economy*. 8(4): 465-8.
_____ (1996b) "Review of *The Post-Keynesian Approach to Economics* by P. Arestis" *Review of Social Economy*. 54(2): 274-78.
Pratten, S. (1999) "The 'Closure' Assumption as a First Step: Neo-Ricardian Economics and Post-Keynesianism" in Fleetwood (ed) 1999: 21-41.
Pressman, S. and Holt, R. (2002) *New Guide to Post-Keynesian Economics*. USA: Taylor and Francis.
Reynolds, P.J. (1987) *Political Economy: A Synthesis of Kaleckian and Post Keynesian Economics*. Sussex: Wheatsheaf Books .
_____ (1994) "Prices and Pricing" in Arestis and Sawyer (eds) 1994: 305-10.
Robinson, J. (1953-4) "The Production Function and the Theory of Capital," *Review of Economic Studies*. 21(2): 81-106.
_____ (1960) *Exercises in Economic Analysis*. London: MacMillan & Co.
_____ (1973) "Foreword" in Kregel, J. *The Reconstruction of Political Economy*. New York: John Wiley and Sons

_____ (1978) "Keynes and Ricardo" *Journal of Post Keynesian Economics*. 1(1):12-18.
Roncaglia, A. (1978) *Sraffa and the Theory of Prices*. Chichester: John Wiley & Sons.
_____ (1991) "The Sraffian Schools" *Review of Political Economy*. 3(2):187-219.
Roscher, W. (1878) *Principles of Political Economy*. New York: 104-5. [Reprinted in Ekelund and Hébert 1990: 252]
Rühl, C. (1994) "Equilibrium Analysis" in Arestis and Sawyer (eds) 1994: 127-33.
Samuels, W. (1997) "On the Nature and Utility of the Concept of Equilibrium" *Journal of Post Keynesian Economics*. 20(1): 77-88.
Samuelson, P. (1962) "Parable and Realism in Capital Theory: The Surrogate Production Function" *Review of Economic Studies*. 29: 193-206.
_____ (1966) "A Summing Up" *Quarterly Journal of Economics*. 80(4): 568-83.
_____ (1983) *Foundations of Economic Analysis*. Enlarged Edition. Cambridge: Harvard University Press.
Setterfield, M. (1997) "Should Economists Dispense with the Notion of Equilibrium?" *Journal of Post Keynesian Economics*. 20(1): 47-76.
_____ (2000) "Expectations, Endogenous Money, and the Business Cycle: An Exercise in Open Systems Modeling". *Journal of Post Keynesian Economics*. 23(1): 77-105.
Saul, J.R. (1995) *The Doubter's Companion*. Toronto: Penguin Books.
Sraffa, P. (1926) "The Laws of Returns under Competitive Conditions" *Economic Journal*. 36(144): 535-50.
_____ (1960) *Production of Commodities by Means of Commodities: Prelude to a Critique of Economic Theory*. Cambridge: Cambridge University Press.
_____ (1962) "Production of Commodities: A Comment". *Economic Journal*. 72: 479.
Summers, L. (1991) "The Scientific Illusion in Empirical Macroeconomics" *Scandinavian Journal of Economics*. 93(2): 129-48.
Suppe, F. (1974) "The Search for Philosophical Understanding of Scientific Theories" in Suppe (ed) 1974: 6-241.
Suppe, F. (ed) (1974) *The Structure of Scientific Theories*. Urbana, IL: University of Illinois Press.
Vickers, D. (1997) "Social Science Fiction and the Suspension of Disbelief" *Journal of Post Keynesian Economics*. 20(1): 89-101.
Walters, B. and Young, D. (1997) "On the Coherence of Post-Keynesian Economics." *Scottish Journal of Political Economy*. 44(3): 329-49.
_____ (1999) "Is Critical Realism the Appropriate Basis for Post Keynesianism?" *Journal of Post Keynesian Economics*. 22(1): 105-23.
Worswick, D. and Trevithick, J. (eds) (1983) *Keynes and the Modern World*. Cambridge: Cambridge University Press.