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Citation: Denis, A. (2007). The hypostatisation of the concept of equilibrium in neoclassical economics. In: V. Mosini (Ed.), *Equilibrium in Economics Scope and Limits*. Routledge Frontiers of Political Economy, 83. (pp. 261-279). Oxford, UK: ROUTLEDGE. ISBN 9780203086681

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*The hypostatisation of the concept of equilibrium in neoclassical economics**

October 2004

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Abstract

The concept of equilibrium has long been a focus for dissent between orthodox and heterodox schools of thought in economics. The paper explores the meanings of ◆equilibrium◆ and attempts to tease apart salient appropriate and inappropriate modes of deployment of the concept. Under far-from-equilibrium conditions, equilibrium is not even an approximate description of the condition of the system, but an abstraction ◆ a state of affairs which might obtain should a process under consideration run to its conclusion. The order of the system is viewed from this standpoint, not as an equilibrium, but as a temporary and ephemeral balance of forces, destined to be disturbed by the passage of time. A specific instance of the deployment of the concept of equilibrium by a neoclassical writer ◆ Robert Lucas ◆ is examined and the conclusion drawn that the concept has been hypostatised: an aspect of a process has been one-sidedly emphasised and substituted for the whole. The temporary is made permanent, and process subordinated to stasis, with clear apologetic results. The paper concludes by suggesting that this hypostatisation exemplifies the contrast between formal and dialectical modes of thought, and that it is in the application of a dialectical notion of equilibrium that the heterodoxy can make its most telling contribution.

1 Introduction

The notion of equilibrium is a focus of controversy in economics, in particular between orthodox and heterodox approaches, yet what is wrong with the concept is not necessarily immediately obvious. How

could we begin to understand economic phenomena without the concept? People have interests. They therefore have a motive to change their behaviour if they find they're not doing the best they can to fulfil those interests, and to maintain their behaviour if they are. How can we even begin to understand the economic behaviour of individual agents without such a notion of individual optimising equilibrium? Without it, it seems, what we do becomes indeterminate, arbitrary, inexplicable. At the macro level too, the pattern of activity is all too often pathological: turbulence, traffic jams, unemployment must have some structure, some stability. The pattern must endure at least long enough to matter to us. For such stability to be intellectually comprehensible, it must occur for a reason, otherwise it is arbitrary and mysterious. Again, some notion of equilibrium, of at least a temporary balance of forces, seems a *sine qua non* of rational enquiry.

So the problem cannot be the use of a concept of equilibrium, full stop. But clearly there *is* a problem. If not in the existence *per se* of equilibrium in economics, then perhaps it lies in the way equilibrium is used, in its *mode of deployment* in economics. It is well known that the use of the equilibrium concept is characteristic of the neoclassical school indeed, orthodox mainstream economics has been criticised from all points on the heterodox compass for its reliance on equilibrium thinking. The point of this paper will be to elucidate the differences between orthodox and heterodox modes of deployment of the notion of equilibrium. In particular, I will argue that the concept of equilibrium in neoclassical economics is a hypostatization. I start by trying to tease out some salient appropriate and inappropriate modes of deployment of the notion in science. I then make some general comments on the deployment of equilibrium concepts in heterodox and orthodox economics and consider a specific instance of equilibrium theorising the case of the New Classical school of thought in macroeconomics in a little more detail. A final section concludes by suggesting that heterodox currents in economics may be well-placed to contribute by articulating a more dialectical conception of equilibrium.

2 Ways of deploying the equilibrium concept

I want here to sketch very briefly what I regard as an appropriate mode of deployment of the equilibrium concept in science. I will first identify two possible valid uses of *equilibrium*, one static and one dynamic, and the one invalid use of the concept with which, I think, neoclassicism can fairly be charged. Then I want to explore in a little more detail the dynamic version, which, though both valid and important, is not employed in neoclassical economics.

I think we can identify three salient uses of the concept of equilibrium.

1. The system is at or near a normal state or condition such that small moves away from it set in motion forces returning the system to the attractor state. The system can be modelled as an equilibrium. For some purposes, the equilibrium can simply be assumed to hold. If greater detail is required, a distinction can be made between a short and long run: in the long run, the system may be considered as, at least approximately, or for practical purposes, in the attractor state; in the short run, (a) changes in exogenous variables shock the system away from the attractor state, and (b) divergence of the system from the attractor state itself sets in motion forces returning it to its normal condition.

Note that the degree of volatility does not in itself make a profound difference of principle: one system may actually be in the equilibrium condition for lengthy periods, and only occasionally moved away from it by relatively small shocks. The forces returning the system to equilibrium following a shock may be sufficiently damped to avoid overshooting. Or the opposite may be true the system is highly volatile, frequently shocked away from equilibrium, with strong endogenous forces leading to overshooting. Both cases may be modelled as equilibrium systems, with average levels of key variables of the system determined by their equilibrium values, the difference being only that the short-

run dynamics are empirically more important, and complex, in the second case. As Weintraub says, equilibrium in a stable dynamic system can be viewed \diamond as a state of no motion, and as an attractor of arbitrary motions of the underlying dynamic process \diamond (cited, Giocoli, 2003: 138).

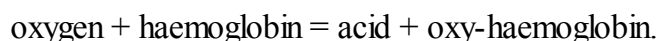
This is nevertheless an essentially static concept of equilibrium, in the sense that stasis is primary, and any dynamics in the model are entirely secondary and subordinate.

2. For a system operating in a far-from-equilibrium context, in the sense described by Prigogine and Stengers (1984)^[1], the processes underpinning the continuity of the system as a whole may be conceived as equilibrating processes; however, the equilibrium towards which they are moving is never attained as other processes intervene and prevent them from running to their conclusion. The persistence of the system as a whole depends on the maintenance of these equilibrating processes, and the disequilibria giving rise to them. The equilibrium which constitutes the logical terminus of each of these processes, were it ever attained, would also spell the dissolution of the system itself. In this case the *equilibrium* of the equilibrating processes is not how they *are*, but how they *would be*, were they to continue in isolation. *Equilibrium* is an abstraction, a helpful one perhaps, but not one which describes anything that exists.

This is an *essentially* dynamic use of the equilibrium concept: the dynamics of the processes underpinning the system are primary, and any possible, conceivable state of rest is secondary, an extrapolation. The difference between the two valid deployments of the concept of equilibrium can be put thus: in an at-or-near-to-equilibrium system only changes in exogenous variables can move the system as a whole away from its equilibrium. In the far-from-equilibrium case, the system exhibits regularity and orderliness, a homeostasis in living organisms, but these do not themselves constitute an equilibrium: the mere passage of time brings about changes in the system as endogenous changes in the processes on which the system depends bring about the growth and decay of the whole. A notable feature of both the static and dynamic concepts is that, to be meaningful, the theory has to articulate the equilibrating processes, that is, to give an account of the operation of those forces when the system is out of equilibrium, regardless of whether its normal condition can be characterised as an equilibrium.

3. The attempt to apply the equilibrium concept, valid in the first kind of system indicated above, to the second, where it is not, constitutes a hypostatisation. It substitutes something which is merely an aspect, moment or tendency implicit in the system, for the system itself. The argument of this paper is that although valid applications of the first kind of equilibrium abound in neoclassical economics, as in other schools of thought in political economy, not only is the second kind absent in mainstream economics, a critical shortcoming in itself, but it is systematically replaced by the third kind, the illegitimate use of an equilibrium concept to describe a system dependent on the continuation of disequilibria.

I want now to sketch very briefly what I regard as an appropriate mode of deployment of the equilibrium concept in science ignored by neoclassical economics, the dynamic equilibrium concept identified at (2) above. For my main example (for which I am indebted to Pask, 1998: 75-77), I will look at the equation for the formation and dissolution of oxy-haemoglobin in the process of respiration:



The equation above can be understood as expressing an equilibrium in which all four reagents exist together in

stable proportions. Our theoretical understanding of the structure and properties of the molecules of each of the four reagents, and practical experiment and observation, can tell us what those proportions are, and what can be expected to happen if we exogenously change the quantity of any of the four in a closed system. This knowledge makes an essential contribution to our understanding of respiration. But we don't model respiration as an equilibrium, a state of rest to which internal forces will return us if we should be shocked away from it. On the contrary, we model respiration as a system of interacting processes: in the lungs, the partial pressure or concentration of oxygen is high, pushing the equation from left to right. In the tissues of the body the opposite is the case and the equation proceeds from right to left. In each case the oxygenated or, respectively, reduced haemoglobin is swept away by the blood stream: at each locus the disequilibrium is maintained and continues indefinitely. So the equilibrium relationship is understood as embedded in a process. It is understood as an attractor towards which one set of forces is bringing the system, at the same time as another set is pushing it away. Yet knowledge of the equilibrium, which in reality could only occur with the death of the organism, is essential to understanding life.

The story told is an *essentially* dynamic one, in which equilibrium is an abstraction, a moment, a tendency. The notion of equilibrium points beyond itself: equilibrium in the cell to equilibrium in the lung, reduction of oxy-haemoglobin to oxidation of glucose, the transport of one reagent (oxygen in the form of oxy-haemoglobin) to the transport of another (the carbon dioxide generated in cellular respiration), the process of respiration to the processes of nutrition in this and photosynthesis in other organisms, and so on.

Neoclassical economics, by contrast, infers that the economic system is always in or near an equilibrium and hence can be understood in equilibrium terms. Equilibrium is not understood as an abstract moment or aspect of a living system, but as an approximate description of the way things are. Movement and change can be regarded as secondary, as the recovery of the state of rest by adjustment to exogenous shocks. Hence, equilibrium as a valid aspect or moment of the real economic process, is abstracted and turned into something lifeless and static. Any thing or process in the world is a unity of stasis and change, of continuity and discontinuity: to abstract a real part of that unity, and one-sidedly make it primary is to hypostatise or reify it. To do so denies the real process and presents the present, the status quo, as permanent.

Although characteristic of living systems, what has been said above applies much more generally. A further instance concerns the hydrological cycle of evaporation and condensation by means of which water vapour from the seas falls on land as precipitation and is returned to the sea by the drainage system. Both condensation and evaporation are disequilibrium phenomena — they are phase changes in opposite directions between the liquid and gaseous states of water, and occur under opposite conditions. Evaporation occurs in the presence of relatively dry air and a source of energy. Just as in the case of the oxidation of haemoglobin, the process would rapidly run to equilibrium — and hence cease — in a closed system. The process can only continue to the extent that the now relatively humid air is removed and replaced by drier air, by the action of air currents, themselves brought about by convection currents in the atmosphere as the planet exchanges heat with its environment.

In these cases we *cannot* model the condition of the system in question as an equilibrium. What is required is a dynamic model of each of the relevant processes underpinning the system, and their interaction. These processes can and, indeed, should be seen as equilibrating forces, forces brought into existence by the disequilibrium of the system, forces which in a closed system would lead to an equilibrium and the end of the system which they underpin. If the oxidation and reduction of haemoglobin, or the evaporation and condensation of water, are in equilibrium, then there is no respiration and no hydrological cycle. To describe such equilibria may be helpful and add to our knowledge of the process at work. But what is being described is not a state or condition of the world, or even an approximation to it, but a hypothetical — the logical terminus of processes taken in isolation.

Equilibrium and stability

Up until this point I have exclusively used the term *equilibrium* in the more formal, demanding and precise sense normally adopted by economists. In this sense, an equilibrium, once achieved, will endure forever, barring exogenous shocks. However, the term is also used also in a looser, more common-sense way to indicate an equal balance between opposing forces, without any assumption of persistence or permanency. The Appendix to this paper sets out the dictionary definitions of the term starting with this common-sense meaning. In this usage, an initially weak army which is gaining strength and a stronger one which is becoming weaker will at some point find themselves in equilibrium. This is clearly not a formal equilibrium in the sense that only exogenous shocks will disturb it, and endogenous forces will then restore it. I take no exception to this looser usage. Where there is indeed persistence it is often better to use the term *homeostasis*, but the two are often used interchangeably. On the first page of Gordon Pask's introduction to cybernetics, he explains that the theme of cybernetics is

how systems regulate themselves, reproduce themselves, evolve and learn. Its high spot is the question of how they organize themselves. The crux of organization is stability. Equilibrium is always implied by the word stability. A great deal of cybernetics is concerned with how stability is maintained with control mechanisms. (Pask, 1968: 11)

So, according to Pask, much of cybernetics is concerned with the study of mechanisms which maintain equilibrium. But this is emphatically not the formal notion equilibrium employed in neoclassical economics. We can see this when he discusses biological instances of control:

The overall homeostatis (sic), preserving the organism, can be expressed as the conjoint action of many homeostatic systems, each preserving a structure or condition needed for the functioning of the others. The mechanism of breathing maintains several homeostatic equilibria. Many mechanisms co-operate to maintain one equilibrium. (Pask, 1968: 73).

This, I submit, is how economics should be.

3 Equilibrium in heterodox economic thought

In one sense it is an empirical matter which of the two valid approaches indicated above is appropriate in each case. To say that the static notion is characteristic of neoclassicism is not to deny that heterodox writers also deploy this notion. Writers such as Marx and Keynes, to take two prominent examples, both have static notions of equilibrium, which they use repeatedly, throughout their work.

Keynes, for example, asserts his agreement with the first fundamental postulate of the classical system that the wage is equal to the marginal product of labour (Keynes, 1973: 5, 17). The implication is that demanders of labour are always in equilibrium: at each given level of the wage, firms employ just that quantity of labour which maximises profits. Should the wage exceed the marginal product of labour, each firm would have an interest in reducing employment, and *vice versa* if the opposite should hold. In equilibrium agents have an incentive to continue their current behaviour, out of equilibrium they have an incentive to change their behaviour so that the equilibrium is restored. In exactly this vein, Victoria Chick gives us a further instance of Keynes making use of the equilibrium concept:

A producer decides how much to produce, and possibly how to price the product, then waits for the market's response. If his expectations are falsified, he might change the level of output ('might' because one observation is not enough to know with any confidence that the 'error' was not random). If he was (roughly) right, and no new information from other sources changed his expectations, he would continue as before. The same outcome for all

producers, on average, would produce an equilibrium of output and employment. (Chick, 2002: 4)

Marx, too, adopts this approach at many points in his analysis. The exchange of commodities in what Marx calls simple circulation of commodities (Marx, 1954: 154) takes place at their values, their incorporated social labour. But this is only so on average, in equilibrium. The exchange of commodities at their value is the natural law of their equilibrium (Marx, 1959: 188). Specific prices will deviate from values because of all sorts of extraneous circumstances errors and frauds, the exertion of force, temporary over- and under-supply, and so on.

Exactly the same goes for Marx's account of the relation between market prices and prices of production in the circulation of capital:

if the commodities are sold at their values very different rates of profit arise in the various spheres of production. But capital withdraws from a sphere with a low rate of profit and invades others which yield a higher profit. Through this incessant outflow and influx it creates such a ratio of supply to demand that the average profit in the various spheres of production becomes the same, and values are, therefore, converted into prices of production. Capital succeeds in this equalisation, to a greater or lesser degree, depending on the extent of capitalist development. The incessant equilibration of constant divergences is accomplished so much more quickly, 1) the more mobile the capital; 2) the more [mobile the] labour-power (Marx, 1959: 195-196).

Thus equilibration depends on the flow of capital and labour between industries to bring about an equal rate of profit in every industry, an equalisation which cannot be expected to be either instantaneous or perfect. Price will equal value in simple commodity circulation, or price of production in capitalist circulation the equilibrium price in each case only by coincidence, as it were, in the process of the higgling of the market. The resulting equilibrium is a temporary and ephemeral balance of forces, destined to be disturbed by the passage of time exactly as Keynes's equilibrium levels of output and employment in the passage from Chick cited above.

It would be mistaken, however, to see this as fundamentally in conflict with the notion of equilibrium deployed in much of neoclassical economics. The price of production is the long-run equilibrium price in the sense that it is the centre of gravity which continually attracts the commodity's price. Deviations of price from price of production are due to exogenous factors, such as fluctuations in supply and demand, whose effects are eliminated over time by movements of capital between firms and industries. It would be mistaken to claim that equilibrium characterises the short run and disequilibrium the long run. It is indeed the case that the higgling of the market will bring about the accidental equality of price and price of production from time to time. That is an accidental and ephemeral instantaneous equilibrium. But the reason for the deviation from equilibrium which then ensues is the intervention of exogenous factors, not the continuation of any endogenous processes. Were exogenous shocks no longer forthcoming, the system would settle down to a long-run equilibrium. The magnitude and frequency of such shocks are a matter of the volatility of the exogenous variables and raises no difference of principle between a system which is normally very close to equilibrium, and one which is frequently shocked further away. Even with the continuation of such shocks in the longer run the equilibrium acts as an anchor for the system and continues to determine long-run values of the key variables.

In both the examples from Keynes and Marx, use has been made of the same equilibrium concept which characterises neoclassical economics, a use which is appropriate in context. No social science can do without this concept of equilibrium. But the approach of writers such as Marx and Keynes (Denis, 2002) is, in different ways indeed, profoundly historical: the economic system population, technology, accumulated wealth and the systems of social relations within which economic activity takes place are all conceived of as evolving and developing, not in response to the impact of exogenous factors, but from their own inner

nature.

A critical example for both concerns the accumulation of capital. Both writers regard capital accumulation as the subordination of consumption to production as a critical component of the economic system. Both draw the conclusion of a long-term decline in the rate of profit, with periodic crises of realisation due to the overproduction of capital. For them, a static situation with a given capital stock can be imagined and studied, but the mere passage of time must disturb the imagined peace it is in the nature of the capital stock to grow, to self-augment, without the need for any prompting by exogenous variables.

The main purpose of this paper is to sketch a fundamentally dynamic concept of equilibrium which is legitimate and productive in economics, and to present a *prima facie* case that, instead of that concept, neoclassical thought deploys a fundamentally static concept of equilibrium: a substitution which I argue hypostatizes *equilibrium*. The purpose of this section has been to underline that the static notion is not in itself flawed indeed, heterodox writers such as Marx and Keynes make free use of it but inappropriately deployed in neoclassical macroeconomics. The next two sections examine that appropriate deployment in greater detail.

4 Equilibrium in neoclassical economic thought

Giocoli, in a history of mid-20th century neoclassical economics (Giocoli, 2003), distinguishes between two self-images of the neoclassical paradigm the *systems-of-forces* (SOF) and the *systems-of-relations* (SOR) views. Both embody equilibrium theories, but

According to the SOF image [the focus is on] the explanation of *how and why* a certain equilibrium has been reached, while according to the SOR image it is the demonstration of the existence of an equilibrium, though not of [its] actual, empirical existence but of [its] conceivable, logically or mathematically non-contradictory existence (Hutchison 2000, 19). (Giocoli, 2003: 5)

Giocoli identifies the principal theme of the development of economics in the 1930s as

the last important attempt to preserve, if not enhance, the traditional image of economics as a discipline dealing with systems of forces, that is, as a discipline which investigates the actual working of the economic system and, in particular, its equilibrating processes. In a nutshell, the attempt consisted of a reformulation and extension of the notion of economic equilibrium to a multi-period, multi-agent setup as well as an explicit appraisal of the out-of-equilibrium functioning of the economic system. Hence the key theoretical issues became the modeling of the disequilibrium processes The program developed inside a more general theme, that of turning the static neoclassical equilibrium theory into a dynamic one. (Giocoli, 2003: 135-6)

Giocoli argues that this attempt was unsuccessful, partly because of unavoidable inconsistencies between the willingness to investigate the disequilibrium behavior of the economic system and the desire to preserve the notion of equilibrium as the central category of the analysis (Giocoli, 2003: 137). Unsurprisingly, perhaps, it was the preservation of equilibrium which triumphed.

What remained of the original program was, on the one side, the reduced version of dynamics developed in Samuelson's *Foundations*, namely, the analysis of the system's local stability around an equilibrium whose actual emergence was no longer an issue to be dealt with, and, on the other, the general equilibrium model of Arrow and Debreu, which did embrace a multi-period approach but compressed all the dynamics into a time-zero instantaneous equilibrating process. Even when the latter model provided in the late 1950s the benchmark for the analysis of global stability, no actual theory of the out-of-equilibrium functioning of the system could be offered as this was simply impossible in an Arrow and Debreu world. (Giocoli, 2003: 137)

Giocoli touches here on some of the key issues concerning the way the equilibrium concept has been

deployed in the neoclassical mainstream. Two things are clear from his account. Firstly, even the SOF version implies that the economic system can be understood as an equilibrium, and the SOF version can thus be characterised as carrying out a hypostatization of the equilibrium concept. The image of the economy as a whole is one of a static equilibrium, the maintenance of which is explained by the operation of equilibrating forces, forces which only operate once the equilibrium has been disturbed by exogenous forces. This leaves us with a profoundly static and ahistorical image of society: there is no theoretical basis here for immanent development or novelty. The recognition that the model might not be entirely adequate is addressed not by replacing it with the dynamic version identified above, but by adding dynamics on to the static core, notably by relaxing the perfect information assumption and introducing various models of learning and expectations adjustment. Secondly, the SOR version is clearly significantly worse, focusing the entire attention of the researchers involved on the study of theoretically conceivable equilibrium states, divorced from any possibility of learning about the equilibrating processes which might lead to and sustain such states. This, I submit, cuts us off from all possibility of learning about the forces which actually underpin and shape our society.

In the next section we explore in more detail a specific example of neoclassical equilibrium theorising in the work of Robert Lucas, Jr.

5 An instance of neoclassical equilibrium theorising: the New Classical school

The first thing to note about Robert Lucas's *Models of Business Cycles* (Lucas, 1987) is its claim to be dynamic. It is, of course, at the heart of the heterodox critique of orthodox equilibrium theorising that the latter is essentially static, so the claim is significant.

Lucas starts his book with the text of a series of lectures given in Helsinki in 1985 by setting out the subject matter, the process of dynamicization of macroeconomics (Lucas, 1987: 3). He insists on his interest in the law of motion of the system (Lucas, 1987: 7), the law of motion of the system as a whole (Lucas, 1987: 14).

Dynamic economic theory has simply been reinvented in the last 40 years. While Keynes and the other founders of what we now call macroeconomics were obliged to rely on Marshallian ingenuity to tease some useful dynamics out of purely static theory, the modern theorist is much better equipped. (Lucas, 1987: 2)

It all sounds very encouraging: whereas in the past we had to tease useful dynamics out of a purely static theory, nowadays we are much better equipped. The reader might be forgiven for thinking that our theory is no longer essentially static. However, this is not I think what Lucas is saying at all. It does no violence to his argument to read him as saying that the modern theorist is much better equipped than the Keynesians were to tease useful dynamics out of a purely static theory, because while the Keynesians were obliged to rely on Marshallian ingenuity for this purpose, we have something much better, namely the general formalism of dynamic games. It is this formalism which constitutes the critical difference between his own standpoint and Keynesianism: the main criticisms of Keynesian models and their use in formulating policies are all straightforward consequences of the acceptance of the general formalism of dynamic games that I am using here (Lucas, 1987: 16). So we can see that Lucas's references to the dynamicization of macroeconomics cannot be interpreted as a claim that the purely static theory has been replaced by a dynamic one. Rather the purely static theory is retained, but we now are much better equipped to tease useful dynamics out of it. As we shall see, any claim that the purely static theory had indeed been replaced would in any case be a misrepresentation of the neoclassical theoretical standpoints discussed in his book.

At the heart of the models of business cycles to which the title of Lucas's book refers is something called a

Bellman equation (Lucas, 1987: 14, equation (2)), in which

Optimal behaviour means maximising the sum of immediate and long-term pay-offs \diamond the system (2) is in *equilibrium* when each agent i chooses the action a_i which [optimises at the individual level] given the actions \diamond chosen by all the other agents. (Lucas, 1987: 14)^[2]

The individual agent is in equilibrium when he adopts the action which maximises his present and expected future payoffs, given the actions chosen by the other agents \diamond and we have a social equilibrium, a Nash equilibrium, when this is true for everyone:

I have described the actions a_i simultaneously chosen by agents as a (Nash) *equilibrium*, but the term equilibrium in this (now entirely standard) context obviously does not refer to a system \diamond at rest \diamond , nor does it necessarily mean \diamond competitive \diamond equilibrium in the sense of price taking agents, nor does it have in general any connection with social optimality properties of any kind. (Lucas, 1987: 15-16)

The important claim here is that the Nash equilibrium is not \diamond at rest \diamond .^[3] It is important to understand the sense in which the system is not at rest. The reason is simple, and set out early in the first chapter after the introduction:

A useful model \diamond is going to take the form of an explicit description of the way the economy evolves through time. We will want to consider stochastically disturbed systems, so let e_t denote independent drawings of an exogenous shock from some fixed distribution $G(e)$, and let the law of motion of s_t , a complete description of the \diamond state of the system \diamond at date t , be denoted



(Lucas, 1987: 7)

The system is thus not at rest for the reason that it is being continually shocked away from the equilibrium it would have if there were no such shocks. But those shocks are entirely exogenous: nothing in the model affects the magnitude or sign of the shock in each period \diamond other than the statistical properties of the distribution $G(e)$, which themselves are a timeless given. Hence the equilibrium which actually obtains at one moment in time is different \diamond not only from the equilibrium at any other point in time \diamond but also from the equilibrium if applied again to *the same point in time*, since the drawing from the distribution $G(e)$ of exogenous shocks will be different. A simulation based on the Bellman system of equations will therefore appear to show change over time. But this is an impoverished notion of change, as we will see below. It is, in Lucas's own phrase, dynamics teased out of a purely static model, a very long way indeed from a truly dynamic conception of the economy.

So in what sense is this an equilibrium approach? It is an equilibrium approach because the Bellman equation is timeless. Given the tastes and preferences of individuals, technology and government policy, the outcomes will always be the same for the same shocks: none of these things are themselves endogenised. Each individual is in equilibrium as it is assumed to optimise subject to the actions of all other agents; the society is in continuous equilibrium as all individuals continuously optimise. With the addition of the shocks, change takes place but not development; it is just the same distribution of events being randomly selected from. The system has been \diamond dynamicized \diamond \diamond time has been impounded. But the time involved is fake time, fictitious time: it is a logical time, not a historical time. What comes first is equilibrium, and process is secondary. We move between one equilibrium position of the economy and another. But there is no rhyme or reason to the transition, and no arrow of time. Any actual simulation would be just as good in reverse.

Without examining the subsequent models which Lucas discusses, at a level of detail which would rapidly become tedious, we can say that these features, and, in particular, this use of the concept of equilibrium,

remain for the duration. For Lucas, change is *equilibrium change* throughout, as he himself indicates later on with reference to the Kydland and Prescott Real Business Cycle model (Lucas, 1987: 38, equation (10)):

the study of (10) thus provides an indirect method for describing the competitive equilibrium motion of the endogenous state variables the equilibrium behavior of the capital stock can be simulated by drawing shocks $\{x_t\}$ from the assumed distribution $G(x', x)$ the model generates time series for these variables (sc consumption, employment, and factor prices) as well (Lucas, 1987: 39-39).

In the conclusion of the book, Lucas returns to the purpose of the series of lectures which it records, that is, to consider, particularly in relation to policy, the incorporation into macroeconomics of economic dynamics (Lucas, 1987: 103). So again, in Lucas's view we have a macroeconomics which is still purely static, but into which it is possible to incorporate some dynamics that is, dynamicizing it does not overthrow it completely or change it beyond recognition, but adds something to make the static equilibrium account a better approximation to the world. So the static equilibrium concept is still primary, and dynamics, however favoured by Lucas, a secondary add-on. The whole fails to become truly dynamic: the dynamics are too leaden, too tied to the statics.

To take what is perhaps the most important example of what is being left out here, it is highly significant that there is no systematic capital accumulation leading to a declining marginal efficiency of capital, or rate of profit, as suggested by Keynes and Marx. Much of Chapter V (Lucas, 1987: 48-69) is taken up with a discussion of a model due to John McCall^[4], which he reviews very favourably. There is *no capital* in this model:

The general equilibrium in this McCall economy is one of autarchy: workers do not have to deal with capitalists, since capital (trees) is so abundant that it is not worthwhile to establish property rights in it; neither do they trade with each other, since all any of them obtain from their labor is a single good: apples. (59-60)^{[5],[6]}

Later on (Lucas, 1987: 98-100) Lucas discusses his own paper Expectations and the neutrality of money^[7], in which capital in all its forms was excluded from the model (Lucas, 1987: 100). Of course, any model has to make simplifying assumptions and leave things out, but to imagine that one can have a whole economic research programme in which the elephant in the living room of self-augmenting capital is systematically ignored must surely lead to utter sterility of thought.

This section has looked at a specific instance of neoclassical deployment of the equilibrium concept and suggested that Lucas's notion of equilibrium change represents an impoverished notion of process and time, in which equilibrium and stasis dominate process and motion, change is without development, and time without history.

6 Conclusion: from equilibrium to dialectics?

The neoclassical use of the concept of equilibrium has been criticised by post-Keynesians, Marxists, Austrians, institutionalists and other heterodox currents. The paper has argued that there are two possible valid applications of the concept of equilibrium in economics. Any model of the economy will contain variables in a static equilibrium relationship: disturbances which move the variables from that relationship set in train equilibrating forces. On the other hand, any worthwhile model of the economy as a whole will impound its far-from-equilibrium status, and treat the processes on which it depends as equilibrating forces which can never reach equilibrium while the system as a whole persists. In line with its reductionist ontology, which denies the micro-macro dichotomy and attempts to reduce all economics to microeconomics, neoclassical economics ignores this distinction, and stretches the static equilibrium concept to circumstances where only

the dynamic version is appropriate. The result is a hypostatization: the equilibrium which is only an abstraction and extrapolation, the logical terminus of a component process taken in isolation, is extracted and one-sidedly substituted for the whole. The temporary is made permanent, and process subordinated to stasis, with clearly apologetic results.

I would like to conclude by suggesting that this hypostatization exemplifies the contrast between formal and dialectical modes of thought, and that it is in the application of a dialectical notion of equilibrium that the heterodoxy can make its most telling contribution.

Sciabarra (2000) argues that making process primary, which we might expect of Austrian economists, is the essence of dialectics, which we might (wrongly, in his view) identify with Marxism:

One of the principles of dialectics is that in any analysis of any object of inquiry our understanding of the object must include a focus on dynamics. How an object comes to be what it is, which forms it currently takes, and where it might be tending are all a part of its identity (Sciabarra, 2000: 141).

This view has ramifications for relations conceived dynamically Norman argues correctly that we cannot construct change and motion out of static elements. Our analysis must begin with the fact of change, from which we can abstract and inquire into particular moments some economists in the Austrian tradition hold that process is one of the most important aspects of any analysis. Rizzo argues, for example, that in the neoclassical static conception of time, the present is a virtual stop the very negation of passage or flow. (Sciabarra, 2000: 183-184)

If this view is, as I believe, fundamentally correct, the full answer to the question, what is wrong with equilibrium analysis in neoclassical economics can only be given by contrasting it with a dialectical approach. Hegel, at the beginning of the *Science of Logic* (Hegel, 1929: Ch 1), shows the inadequacy of a static concept of *being*: *being* consists of the two dynamic categories of coming-to-be and ceasing-to-be, of origin and deace. Hence in reality, anything which *is*, can only be understood as in *transition*, and, as Keynes says, it is in the transition that we actually have our being (Keynes, 1973: 343 footnote 3). Perhaps it is here that the heterodoxy can make its most telling contribution.

Appendix: The meanings of *equilibrium*

The *OED Online* (Simpson and Weiner, 2000) entry under the catchword *equilibrium* starts with an etymology, according to which the word is derived from the Latin *quus* equal and *libra* balance. In a physical sense *equilibrium* is, in the words of the first definition given,

The condition of equal balance between opposing forces; that state of a material system in which the forces acting upon the system, or those of them which are taken into consideration, are so arranged that their resultant at every point is zero. (Simpson and Weiner, 2000: equilibrium)

A *resultant* in turn is: the total or sum, material or, metaphorically, other than material force which is the equivalent of two or more forces acting from different directions at one point, or, more generally, the composite or final effect of any two or more physical or non-physical forces, the product or outcome of something (Simpson and Weiner, 2000: resultant).

As an extension of this meaning of equilibrium, the *OED* introduces an equilibrium of temperature, where two bodies having the same temperature are said to be in such an equilibrium, since there is now no force causing either to change their temperature when the two are brought together. The implication is that a temperature differential or gradient introduces a force for change and hence constitutes a state of disequilibrium.

Extending the idea again, in a similar way but more systematically, the dictionary introduces the second definition of equilibrium, ♦ The state of equal balance between powers of any kind; equality of importance or effect among the various parts of any complex unity. ♦ This implies that a state of formal disequilibrium, where the forces in some system were unequal and therefore there was a tendency to some change in that system, might still be considered an equilibrium since the powers bringing about that change are equally balanced, and hence there is no tendency to change the rate of change itself: there is a steady state of change. Having subsumed not merely the *state*, but also *the rate of change* of a system, in a concept of equilibrium, there is little to stop one going further and assuming not a *constant* rate of change, but one itself subject to steady change ♦ a steady state of acceleration. And so on.

To illustrate:

- (a) An object which has fallen from a height is in equilibrium on the ground, as the acceleration towards the earth's core due to gravity is exactly offset by the acceleration away from it due to the reaction of the ground the body is resting on. The body is stationary: we have an equilibrium of forces in which the body is at rest.
- (b) Before impact, the body is moving, but can be considered, if it has reached terminal velocity, to be in equilibrium, since the force of gravity is, again, exactly matched by the resistance of the air, such that the body is subject to no new net acceleration and tends merely to continue its uniform motion, to continue its descent at the same speed.
- (c) Before reaching terminal velocity, the body is accelerating, but if it is accelerating at a constant rate, such as 9.8 ms^{-2} , then again it can be said to be in an equilibrium by a similar argument.
- (d) But if the rate of acceleration is declining, as indeed it must be if it is to reach a terminal velocity, then if the rate of decrease of the rate of acceleration is constant, it can still be said to be in equilibrium.

The implication is that the concept of equilibrium seems to be indefinitely extensible, via an infinite regress, to mirror the changing nature of the real world. We will return to this point.

Thus far we have only considered the general notion of equilibrium, not the specific usage of the term in economics. In the 1993 Additions to the Second Edition, the *OED Online* dictionary notes a specific instance of the meaning in Economics: ♦ A situation in which supply and demand are matched and prices stable. ♦ Examples are cited from Jevons, the *Encyclopaedia Britannica*, Keynes's *General Theory* ♦ ♦ Effective demand, instead of having a unique equilibrium value, is an infinite range of values ♦, Hanson, *The Economist*, and Frank Hahn. By the argument above, however, *equilibrium* in economics could refer, much more widely than merely to the equality of the forces of supply and demand, to any situation of stasis, of constant change, of constantly changing rate of change, or any regularly occurring changing situation. So we have stock and flow equilibria, equilibrium prices and rates of inflation, and so on. In sum, it seems, *equilibrium* ♦ in economics as well as natural science domains ♦ need not imply stasis, but that the forces involved in the system under consideration are lawful and regular rather than arbitrary.

This is significant for our enquiry, since it creates the impression that, taking the argument to its logical conclusion, we can understand *any* situation whatever as in some sense an equilibrium: all we need to understand the situation is to know what the powers are which are involved, and the magnitudes, and rates of change of the variables resulting from the interaction of those powers. It is clear that neoclassical economics makes this implication. To take the example of economic growth, considered in a well-known textbook:

Usually, equilibrium means that things are not changing. Now we apply equilibrium not to levels but to growth rates and ratios. The steady state is the long-run equilibrium in growth theory. Along the **steady-state path**, output, capital, and labour grow at the same rate. Hence output per worker and capital per worker are constant. (Begg, et al,

2003: 428)

But this approach is an illusion: in this vision we only approach reality by an infinite regress. To assume that we know all the powers involved, their magnitudes and rates of change of variables caused by the interaction of the powers is to assume that we already know the system, that the infinite regress has been completed. Note, also, that as we go from rest to constant motion, and from constant motion to constantly varying motion (constant acceleration), and from that to constantly varying acceleration, we still retain the unwanted baggage of smoothness and constancy at each stage. However far we may proceed along this infinite regress, we never reach the concrete, we never apprehend time, novelty, or the intrinsic lumpiness of the world.

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Notes

* This paper has been presented at the *Dissent in Science* seminar, CPNSS, London School of Economics, April 2004, the annual conference of the Association for Heterodox Economics, Leeds, July 2004, and the annual conference of the International Network for Economic Method, Amsterdam, September 2004. I should like to thank participants in these discussions, and, in particular, Victoria Chick, Mary Denis, William Dixon, and Valeria Mosini for their comments, support and encouragement in writing this paper.

[1] Prigogine and Stengers argue that *social evolution* has usually involved an unfortunate importation into the social sciences of concepts such as optimisation and equilibrium which had only a restricted validity even in their native domain of physics. Ignoring the *openness* of systems, we also ignore *inertial constraints* (ie path-dependence, hysteresis), the possibility of surprises, the incorporation of time and history, and *fundamental uncertainty* (Prigogine and Stengers, 1984: 207).

[2] All emphases in citations are exactly as in the original AD.

[3] The claim that the equilibrium implies nothing for social welfare is also interesting and I have dealt elsewhere (Denis, 2004) with the issue of the relationship between individual optimisation and social optimality, with particular reference to Lucas.

[4] JJ McCall (1970) *Economics of information and job search*, *Quarterly Journal of Economics*, 84(1) February 113-26.

[5] While in this model there is no capital, McCall goes to the opposite extreme and beyond with labour: the model also supposes there is a *continuum* of workers (Lucas, 1987: 60) that is, between every two workers there is another worker: not just an infinity of workers, but a higher infinity. Neither of these assumptions is particularly uncommon in neoclassical macro models.

[6] Notice that Lucas tacitly concedes here that a useful concept of capital will address social relations, not things: there is no capital, but not because the means of production, apple trees, do not exist, but because no one wants property in them, that is, to exclude anyone else from using them.

[7] RE Lucas (1972) *Expectations and the neutrality of money* *Journal of Economic Theory*, 4(2): 103-24.