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Savings, Investment and Capital in a System of General Intertemporal Equilibrium – an Extended Comment on Garegnani with a Note on Parrinello

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6.1 Garegnani’s paper as an indirect critique

Is intertemporal general equilibrium concerned by the Cambridge critique of the theory of capital? Many thought, and for a long time, that it was not the case, since there is no aggregate of capital in general equilibrium theory, at least not in a form which would be visible immediately in the Arrow-Debreu model with a finite horizon (Debreu, 1959). Others suspected that the problems of capital theory would affect all versions of neoclassical theory, without being able to indicate the consequences for general equilibrium. Burmeister (1980, p. 122) introduced the assumption of regularity, i.e. essentially the postulate that the total change in the values of capital goods employed falls whenever a rise of the rate of interest causes a switch of technique. A variant of this assumption was used by Epstein (1987) to demonstrate the convergence of an intertemporal equilibrium with an infinite horizon towards a steady state in which the rates of return on all assets became equal among themselves and equal to the (variable) rates of time preference of the consumers. Here, the relationship with the Cambridge debate was made explicit and it was remarked (see also Burmeister, 1980, p. 125; Schefold, 1997, chapter 18.1) that the absence of reswitching and reverse capital deepening were necessary conditions in neoclassical theory to exclude the specific instability discussed in Schefold (2005a, 2005b) which might prevent the economy from reaching a terminal state with a uniform rate of profit after starting from arbitrary initial endowments of capital goods. Not only the relative quantities of capital goods adapt over time (as in the old neoclassical theories where a value of aggregate capital is given and relative quantities of individual capital goods are thought to adapt) but it is characteristic for the consideration of the very long run that even the general level of the production of equipment adapts and distribution depends eventually only on preferences and technology, not on quantities of capital supplied in the initial state.

The terminal state reached, though similar to a classical long period position, insofar as there is a uniform rate of profit, differs from it not only with regard to the theory of distribution, but also the state of employment, for classical long period positions are not necessarily full employment equilibria.
However, the destabilising effect of a ‘perverse’ relationship between factor prices and quantities of factors need not only be associated with the path of accumulation towards a ‘distant’ horizon. For the destabilisation happens in a certain period in the process of transition, and it can therefore be analysed by restricting one’s attention to a small number of periods around the one where the destabilisation occurs. Schefold (2005a) analyses accumulation in a two-period model and compares the stability of two scenarios. In the first, the response to an increase of the labour force is a substitution of technique such that the more labour intensive technique is chosen at a lower wage rate, as conventional theory predicts. Reswitching, in the second scenario, means that the adoption of the more labour intensive technique must be associated with a higher wage rate. A full employment equilibrium still exists, but its stability is in doubt. The intuitive reason is simple: the increase of the labour force causes the market wage rate to fall in the short run, if the system is competitive in the neoclassical sense. Reswitching (or more generally: reverse capital deepening) then means that techniques with a higher and not (as normally expected) lower intensity of capital will be adopted, so that unemployment tends to rise, not to fall, and wages will fall further. The analysis of this instability presupposes the specification of out-of-equilibrium behaviour, and even tâtonnement can take several forms. A general instability result cannot be obtained because of the diversity of potential reactions. Hence, it can be shown that reswitching and related problems of capital theory imply less stability than technical changes in which the quantities of factors and factor prices are inversely related as in the traditional neoclassical world.

Such an analysis represents a direct critique of modern intertemporal general equilibrium theory. It accepts the methods of the theory and its representation of economic reality, and it shows that neglected problems of technical change question not the existence, but the significance of equilibria by showing that the problems of capital theory surface as problems of stability.

The paper by Garegnani I have been asked to comment upon (Garegnani 2003) follows a different strategy by proposing a critique which I should like to characterise as indirect. This indirect critique is based on concepts of aggregate capital which, in a reformulation of intertemporal theory with a finite horizon, are made to play a causal role in the determination of equilibrium. Once this role of aggregate capital is accepted, it is not surprising to see that unstable equilibria may result since similar phenomena have been known from the debate on the aggregation of capital which is now over forty years old. Garegnani is aware that the proponents of intertemporal general equilibrium theory have consciously moved away from the use of aggregate concepts of capital – indeed, Garegnani (1976) is well known for having clarified the difference between an ‘old’ neoclassical concept of equilibrium based on the datum of an aggregate quantity of capital on the supply side, and a ‘new’ theory in which capital is given as a vector of endowments so that, since these endowments are inherited from the past in arbitrary proportions, different commodities have different own rates of interest which reflect different degrees of scarcity relative to consumption (except in the very long run where only preferences and technology matter, if convergence obtains).