The Wage-Interest Frontier: A Reply to Dr. Orosel

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In a recent article in this journal [3], Dr. Gerhard O. Orosel investigates the conditions for and the implications of wage-interest curves with upward sloping segments. He uses a model of production which I developed in an earlier article [1], and reaches two main conclusions: (i) that "it is the possibility of costs occurring at the end of the production process, which is responsible for the possibility of bumps in the factor-price frontier"; he calls them "shut down costs" [3] (p. 107); (ii) that "although such a factor-price frontier is theoretically possible, it is not very likely that it can occur under given economic and technical conditions since it would imply that capitalists are a class of borrowers (from nature) whereas we can be fairly sure that they are a class of lenders" [3] (p. 113). The purpose of this note is to show that both conclusions are mistaken.

"Shut down Costs"

Costs occurring at the end of the production process are not a necessary condition for the occurrence of upward sloping segments in a wage-interest curve. Imagine a production process with an infinite lifetime, which is expected to be operated indefinitely, so that we cannot even conceive "shut down costs". That process might generate a wage-interest frontier with upward sloping segments if, for instance, the process once started is unstoppable (like a chain reaction); or if, say, the process leads to pollution of the environment with a time-lag and firms are made to pay for the cost of eliminating pollution (either directly or by means of a tax just sufficient to cover the anti-pollution cost born by the taxing authority). The necessary conditions for the appearance of upward sloping segments in a wage-interest curve are (i) that the present value of a process, which in the
model considered (perfectly competitive equilibrium and constant returns to scale) is zero at the time the process is started, should become negative at some stage; (ii) that the process, once started, cannot be "truncated" [2]. "Shut down costs" are simply one of the factors that may bring about condition (i), and do not deserve a separate treatment.

The interesting case where "shut down costs" are only met if the process is truncated before its physical lifetime, or, more generally, where "shut down costs" depend on the length of time for which a process is operated, can be treated by applying the same conditions (i) and (ii). Here each alternative length of operation of a process, with the "shut down costs" associated with it, has to be considered as a separate process which by definition cannot be truncated (because truncating would alter the technical coefficients of shut down costs, and would turn it into a different process). Conditions (i) and (ii) now must apply to whatever length of operation is best (i.e. pays the highest wage rate for any given interest rate, at zero present values at the start).

Necessary and sufficient conditions for the occurrence of upward sloping segments in the wage-interest curve require, beside (i) and (ii), that (iii) the present value of the process from the start to the period before it becomes negative, and the present value of the process from the subsequent period to the end, both obtained discounting to the start period, should have the same absolute value at more than one discount rate. These conditions are the same whatever the technical factors accounting for them, whether shut-down costs, delayed pollution, chain reaction or other reasons.

Dr. Orosel provides [3] (pp. 107--108) a simple and neat proof of the "truncation theorem", establishing the uniqueness of the internal rate of return on a process at a given wage rate (his proof, incidentally, happens to be identical to the proof contained in another paper of mine [2]). But he does not seem to realise that, as a corollary of that theorem, conditions (i) and (ii) — rather than "shut down costs" per se — are responsible for the possibility of upward sloping segments in the wage-interest curve. His emphasis on shut-down costs is therefore misplaced; those costs are simply a plausible illustration, not an exhaustive category.

Lenders and Borrowers

There is a connection between upward sloping segments of a wage-interest curve and the net lending or borrowing position of capitalists as a class. But, contrary to Dr. Orosel's statements, such segments do