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Capital utilization, economic growth and convergence

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Abstract

Optimal decisions by economic agents regarding the utilization of capital lead to empirically plausible speeds of convergence in one-sector models of economic growth. The relationship between depreciation and capital utilization plays a crucial role in slowing down convergence to the steady state. Cross-country differences in the extent to which the capital utilization decision is internalized along the transition path may lead to differences in convergence rates, even for countries with similar initial and terminal conditions. Finally, by assuming a constant depreciation rate and full capital utilization, standard growth models may be overstating the magnitude of the steady-state equilibrium.

JEL Classification: D9; E0; E2.

Keywords: Economic growth; Capital utilization; Speed of convergence; Depreciation; User cost

1. Introduction

This paper examines the implications of capital utilization for the dynamics of growth and convergence. The concept of capital utilization as an optimal decision is not new to the macroeconomics literature and, in fact, dates back to the early work

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of Keynes (1936). In developing the notion of 'user cost,' Keynes pointed out that 'user cost constitutes the link between the present and the future. For in deciding his scale of production an entrepreneur has to exercise a choice between using up his equipment now or preserving it to be used later on… .'[1] This observation captures both the essence and importance of capital utilization for the dynamics of growth. A more intense utilization of the existing capital stock would cause higher wear and tear and, as a consequence, increase depreciation costs. This in turn would affect new investment in the future.[2]

Although capital accumulation has been assigned a central role in explaining economic growth, little attention has been paid to the implications of the capital utilization decision for the dynamics of long-run growth.[3] Defining capital utilization as the speed or intensity with which a given stock of capital equipment is operated (for example, the 'workweek' of capital), we can identify two important channels through which capital utilization affects the intertemporal growth path of an economy. First, the flow of output depends not only on the existing stock of capital, but also on the flow of services derived from it, through the firms' decision on the intensity (say, length of time) with which that capital stock must be used. Therefore, the capital utilization decision provides the firm with an extra margin to change output. Second, the rate of depreciation depends on the degree of utilization of the capital stock, and is therefore endogenously determined. Specifically, the higher the rate of capital utilization, the higher will be the associated wear and tear of the capital stock, and the higher will be the rate of depreciation. This is in sharp contrast to the existing growth literature, which treats the rate of depreciation as a constant and assumes that the flow of capital services is a *constant* proportion of the underlying capital stock. A constant depreciation rate implies a zero marginal cost of capital utilization, and therefore it is always optimal for the agent to fully utilize capital. In contrast, in the capital utilization model, optimal behavior by the economic agent causes the marginal cost of utilization to change along with the marginal product of the underlying capital stock being accumulated. This affects not only the rate at which the economy is approaching the steady-state equilibrium, but also the transitional path of new investment and hence future output, as the marginal benefits must be weighed against the marginal costs.

The debate on convergence in the growth literature has mainly revolved around two issues. The first is the speed of convergence, i.e., the rate at which the gap between a country's current and steady state per-capita output is being closed. The second is the nature of the convergence path, and concerns cross-country differences in growth rates and standards of living and whether these differences show tendencies to diminish or increase over time. Numerical calculations based on the

[1] Keynes (1936, pp. 69–70); also quoted in Greenwood et al. (1988).

[2] This insight has been used by Lucas (1970), Smith (1970), Taubman and Wilkinson (1970), Calvo (1975), and Oi (1981) to understand and explain investment behavior and business cycles, and more recently, has found wider application in the context of the real business cycle literature; see Greenwood et al. (1988), Basu (1996), Burnside et al. (1996), and Wen (1998).

[3] A few notable exceptions are Betancourt and Clague (1981), Rumbos and Auernheimer (2001) and Dalgaard (2003).