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Increasing returns, capital utilization, and the effects of government spending

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Abstract

We show that a one-sector real business cycle model with mild increasing returns-to-scale, variable capital utilization and saddle-path stability is able to produce qualitatively realistic business cycles driven solely by disturbances to government purchases. Due to an endogenous increase in labor productivity, a positive spending shock can lead to simultaneous increases in output, consumption, investment, employment and real wage. Our analysis illustrates a close relationship between this result and the recent literature that explores indeterminacy and sunspots in real business cycle models under laissez-faire. In particular, the condition which governs the required magnitude of increasing returns for government spending shocks to generate procyclical macroeconomic effects is identical to that necessary for a laissez-faire one-sector real business cycle model to exhibit local indeterminacy.

JEL classification: E30; E32; E62

Keywords: Increasing returns; Capital utilization; Government spending shocks; Real business cycles; Indeterminacy

1. Introduction

Recently, Devereux et al. (DHL, 1996) have explored the macroeconomic effects of temporary and permanent changes in government spending in a one-sector real business cycle (RBC) model with increasing returns, monopolistic competition and saddle-path stability. In a parametric version of the DHL model with logarithmic utility in consumption, indivisible labor and *large* markup ratio of price over marginal cost (=1.5), a positive government spending shock can lead to higher output, consumption,

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investment, employment and real wage.[1] This result is driven by the endogenous response of total factor productivity to a change in government purchases. DHL's finding is an important one since it shows that qualitatively realistic business cycles can be generated in a dynamic general equilibrium framework with only demand shocks. On the contrary, in a standard one-sector RBC model with perfect competition and constant returns-to-scale, aggregate demand shocks yield countercyclical consumption and labor productivity, which is not consistent with the U.S. data (see, for example, Aiyagari et al. 1992; Baxter and King, 1993).

This paper builds on DHL and makes two points. First, to maintain comparability with previous studies that mostly adopt the standard RBC model, DHL restrict the analysis to annual parameterizations in which their economy exhibits saddle-path stability and equilibrium uniqueness.[2] However, we find that DHL's large-markup specification possesses an indeterminate steady state (a sink) and stationary sunspot equilibria at the quarterly frequency whereby the household's rate of time preference and the capital depreciation rate are lower than those in the annual formulation. This result can be understood in two stages. On the one hand, DHL demonstrate that in order to generate positive correlations between government spending shocks and macroeconomic aggregates, the markup must be sufficiently high to imply that the equilibrium wage-hours locus is positively sloped and steeper than the labor supply curve. In this paper, we show that this is also a *necessary* condition for the DHL model to exhibit local indeterminacy. By contrast, Benhabib and Farmer (1994) and Schmitt-Grohé (1997) illustrate that the same condition is necessary for a laissez-faire one-sector RBC model to display multiple equilibria. Therefore, in this respect, our analysis brings together two strands of the one-sector business cycle literature—determinate RBC models driven solely by disturbances to government purchases (as in DHL), and indeterminate, laissez-faire RBC models only subject to sunspot shocks (as in Benhabib and Farmer, 1994; Farmer and Guo, 1994, among others).

On the other hand, we show analytically that the minimum level of increasing returns needed for local indeterminacy in the DHL economy is positively related to the household's rate of time preference and the capital depreciation rate. To understand this finding, suppose that the representative household becomes optimistic about the future of the economy and decides to invest more, thus raising next period's capital stock. If the increasing returns in the firms' production process are strong enough to yield higher labor productivity, the rate of return to today's investment will rise. As a result, agents' initial optimistic expectations become self-fulfilling. When the time step gets smaller, e.g., moving from the annual to quarterly parameterization, labor is drawn more easily out of leisure to help validate agents' optimism. Hence, indeterminacy is more likely to occur when the DHL model is examined under the quarterly parameterization.

[1] In a sequel, Devereux et al. (2000) show that in a one-sector RBC model with sufficiently strong increasing returns (or markup), purely wasteful government purchases may raise economic welfare measured by the steady-state household utility.

[2] The notable exception is Rotemberg and Woodford (1992) who obtain similar results as DHL do in an environment with oligopolistic pricing and increasing returns. While the price-to-cost markup in DHL is a constant, it is countercyclical in the Rotemberg–Woodford model due to implicit collusion.