Variable capital utilization and international business cycles

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Abstract

This paper develops a two-country international business-cycle model with variable capital utilization, using a standard depreciation-in-use technology. Variable capital utilization significantly reduces the required size of productivity shocks needed to replicate observed output volatility by 20–40%. Further, the model generates positive comovement across countries in wages, hours, and investment, while preserving empirically accurate predictions regarding the relative cross-country correlations of output and consumption and the countercyclical behavior of net exports. Finally, accounting for variable capital utilization reduces cross-country correlation of true productivity shocks relative to that of the standard Solow residual.
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1. Introduction

When an economic boom produces high output, employment, and investment in the United States, there is usually a simultaneous boom in other industrialized countries. But,

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why? Answering this question is a central goal of international macroeconomics. The class of open-economy dynamic stochastic equilibrium models that have been developed to this point have had good success at explaining how business cycles can arise as an equilibrium response to "shocks" to productivity. However, multi-country models have struggled with two major problems. The first difficulty, which is a problem shared by closed-economy models, is that the productivity shocks required by the model are viewed as implausibly large and volatile.[1] Second, many open economy models have difficulty explaining why business cycles move together so closely across countries: realistic international comovement of business cycles frequently requires implausibly high cross-country correlations of the productivity shocks.

This paper shows that variable capital utilization overcomes both of these difficulties. Variable utilization of capital is widely believed to be of first-order importance to understanding business cycles.[2] However, international macroeconomic models have so far abstained from incorporating this important channel of response to macroeconomic shocks. In the closed-economy models that incorporate variable factor utilization, the response to exogenous shocks is enhanced. In these models, a productivity shock of a given size leads to a greater increase in output when producers can vary the utilization rate of capital and/or the intensity of labor effort. Thus, a model with variable capital utilization should also require less volatility in exogenous productivity shocks in order to generate realistic levels of output volatility.[3]

In a multi-sector or a multi-country setting, however, variable capital utilization may be even more important. One important problem with many models of inter-acting economies is their prediction of negative international comovement of factor inputs. For example, these models predict that a productivity boom in the US that leads to increases in US output, investment, and employment would be accompanied by declines in investment and employment in Europe. However, this is not what we see in the data: economic booms tend to occur in most developed countries at the same time. The model mechanism that leads to this counterfactual prediction of negative international comovement is the neoclassical investment accelerator, through which investment responds strongly to increases in productivity that are expected to be persistent. Thus, if productivity simultaneously rises in the US and in Europe, but the increase in the US is somewhat larger, the models predict a strong investment flow out of Europe and into the US. There is also an important role for interactions of labor and capital in these models. When capital leaves Europe, the labor that remains there becomes less productive. This will lead to declines in labor input in Europe, which will set off another round of investment outflows because the decrease in labor input reduces the productivity of the remaining capital. The

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[1] Several contributions to the closed-economy literature have explored the role of variable capital utilization in reducing the required size of exogenous productivity shocks. This literature includes contributions by Burnside et al. (1993) and Burnside and Eichenbaum (1996).

[2] See, for example, the work of Bils and Cho (1994), Burnside and Eichenbaum (1996), and King and Rebelo (1999), as well as related empirical analyses by Shapiro (1996) and Basu and Kimball (1997).

[3] An earlier version of this paper, Baxter and Farr (2001), incorporated variable labor utilization along the lines of Bils and Cho (1994). That paper finds that variable labor utilization does not enhance factor comovement, nor does it reduce the required size of productivity shocks.