A demand and supply analysis of productivity growth

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Abstract

The paper rejects growth accounting as failing to reveal the economic forces that drive growth. Instead, it seeks to explain changing productivity growth in terms of economic phenomena such as the changing structure of output, the rate of adoption of new technology, and the strength of aggregrate demand. We introduce such a model and test it using pooled cross section and time series data for 16 OECD economies over a 30 year period. The parameter estimates allow us to decompose each economy's productivity growth into the part caused by its changing structure and the part explained by demand conditions. The estimates are used to account for the productivity slowdown that occurred in these economies after 1973, and to examine the recent productivity increase in the US. The model fully explains this growth surge in terms of the changed demand factors and structure of the US economy. We conclude by arguing that a prime benefit of strong aggregate demand is its stimulation of investment and technological change, leading to the adoption of new technology on a broad front. © 2002 Elsevier Science B.V. All rights reserved.

1. Introduction

A cursory reading of newspapers and magazines suggests there is a broad consensus that information technology (IT), i.e. computer hardware, software and communications equipment, is creating a new era, and will generate economic

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change on a scale comparable to the advent of the steam engine or electricity. This is particularly the case in the US, where a recent acceleration of productivity growth awaits explanation. These two trends—rising productivity growth and rising application of IT—have inspired a surge in neoclassical growth accounting. The approach has been to disaggregate capital formation in computing and related technologies from the more traditional types of investment, in order to see whether the growth acceleration is disproportionately attributable to computer related capital formation (Jorgenson and Stiroh, 2000). Evidence that investment in the IT producing sector and the spreading use of IT throughout the economy, especially in the service sector, is a key contributor to the productivity growth increase in the second half of the 1990s, is then used to support the contention that this is a permanent or (more vaguely) 'ongoing' boost to productivity growth.

Neoclassical growth accounting is generally embedded in a production function framework. It explains growth in terms of proximate supply side factors such as the growth of capital and labour. One shortcoming of this approach is its neglect of structural changes as economies modernize. A second is that it ignores the effect of overall economic performance i.e. the state of aggregate demand, on growth rates. To address these problems, we introduce and test a model that explains economy-wide productivity growth as the outcome of both demand and supply. We stress the role played by changes in the distribution of output and inputs among three sectors, agriculture, manufacturing (or industry) and services. This level of disaggregation is sufficient to show how demand determines the sectors' shares of output and, given sectoral productivity levels and growth rates, governs the allocation of labour and determines the growth rate of average productivity.

We test the model using pooled cross-section and time-series data for 16 OECD economies over a 30 year period up to the 1990s.[1] The parameter estimates allow us to account for the part of an economy's productivity growth due to demand factors and that due to its changing structure. The estimated coefficients are used to account for the productivity slowdown in these economies after 1973. This exercise reveals the relative importance of economic structure and demand as determinants of productivity growth. The same coefficient estimates are also used to examine the recent acceleration of productivity growth in the US. The results show the growth surge to be fully accounted for by changes in demand factors and in the structure of the US economy. We conclude by arguing that the benefits of strong aggregate demand include the stimulation of investment and technological change, and in rapid application of the change on a broad front. Moreover, continued demand pressure creates continued stimulus for investment and technological change, and is therefore a dynamic source of continuous productivity growth. These benefits are not confined to any particular sector, but accrue in response to changes in demand for final goods and services wherever they occur in the economy. While the type and pace of technological change cannot be predicted, we are confident in predicting that strong demand will increase the rates of innovation and of diffusion of available technologies, and in doing so will increase productivity growth.

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[1] 1990s data for all 16 countries were not available at the time of writing.