Investment-specific technological progress in the United Kingdom

Working Paper No. 129

Hasan Bakhshi and Jens Larsen

This paper addresses how rapid technological progress in the information and communications technology (ICT) goods sector contributes to long-run growth in the United Kingdom and how changes in the processes driving this progress may affect the macroeconomic outlook. Academics and policy-makers alike have argued that the US economy experienced an improvement in trend productivity growth in the second half of the 1990s. And technological progress in the ICT sector, with an associated rapid fall in ICT prices, has been a major contributor to US labour productivity growth over this period.

We start from the striking observation that the relative price of ICT goods has been declining steadily but at a very high rate over the past 23 years in the United Kingdom, accompanied by an increase in the real ICT investment to GDP ratio. We develop a model of the UK economy that can account for this fact. The mechanism is simple and intuitive: technological progress in the sector producing ICT capital goods leads to a decline in the relative price of ICT. Firms respond by substituting ICT capital for other types of capital and labour, raising the ICT capital intensity of production. In other words, technological progress in production of ICT capital contributes to output growth through relative price falls that induce capital deepening. In the model, we describe technological progress that applies only to the production of capital goods as investment-specific technological progress, and distinguish it from sector-neutral technological progress which applies to the production of all goods. The main difference between the two forms of progress is that investment-specific technological progress requires that investment is undertaken before it affects final output; sector-neutral technological progress is a 'free lunch' in that it affects final output directly.

Our model can be shown to be a special case of a more general framework, and has some additional appealing features. In particular, we can characterise the balanced growth path of our model of the UK economy, and can quantify the contributions that ICT investment-specific technological progress makes to long-run growth. This long-run growth path has the property that the expenditure share of ICT investment in GDP is constant: while the relative price of ICT is falling, the quantity of ICT relative to output increases, so the value of ICT investment relative to output stays constant. Our results suggest that despite ICT being only a relatively small component of the overall capital stock, ICT investment-specific technological progress contributes very significantly to labour productivity growth along the balanced growth path of our model of the UK economy, accounting for around 20%–30% of labour productivity growth. But this conclusion depends crucially on how ICT prices are measured and the assumed rate of ICT price decline along the balanced growth path.

The paper goes on to consider various scenarios for structural change: first, if the rate of technological progress in ICT production increases temporarily, resulting in a temporary pick-up in the rate at which ICT prices decline; second, if the rate of technological progress increases permanently, and third, if structural changes lead to temporary increases in the expenditure share of ICT investment in overall output. We show that this last scenario can account for the increase in the rate at which the aggregate capital stock depreciates, as appears to have been observed in the United Kingdom in the 1990s.