Productivity growth in the 1990s: technology, utilization, or adjustment?

A Comment

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Adjustment costs have led a separate life from cyclical productivity measurement in research on the dynamics of production. Basu, Fernald, and Shapiro bring the two subjects together in this important paper. Basu and Fernald are established leaders in cyclical productivity and Shapiro on adjustment costs. The collaboration in this paper brings important advances to our understanding of recent productivity growth.

Periods of rapid employment and capital growth such as the 1990s are times when adjustment costs are high, so the standard Solow residual understates productivity growth. Resources actually used for installing capital and recruiting workers are mistakenly identified as inputs to actual production, overstating input growth and understating productivity growth.

The original Solow residual had no unknown parameters. The research in this paper introduces two parameters to Solow's framework. First, in earlier work, Basu and Kimball pursued the idea successfully that hours of work are a good proxy for all cyclical variations in work effort and capital utilization. One parameter, \( \xi \), captures the effects of these variations on total inputs. Second, a parameter \( \gamma \) measures returns to scale, in a setting where it also measures the ratio of price to marginal cost. A competitive industry has \( \gamma = 1 \). They estimate these two parameters from their data.

Rather than estimate parameters of the adjustment technology, they draw on Shapiro's earlier work. They estimate an equation with output growth plus adjustment cost growth as the left-hand variable, and growth of hours and growth of total input as the right-hand variables. The coefficients of

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these two variables are estimates of $\xi$ and $\gamma$. The authors' primary interest in this equation is to extract its residual, interpreted as a pure measure of productivity growth. But it is useful to consider the estimates.

Table 1, which gives the basic results, contains one conspicuous anomaly. The returns-to-scale parameter, $\gamma$, for non-durable manufacturing is only 0.78. This industry has severe decreasing returns. This finding deserves further investigation. The literature on short-run productivity fluctuations has always anticipated and tried to explain estimates greater than one. The finding of a value less than one—and statistically unambiguously less than one—is hard to square with any reasonable view of the industry. It means that measured productivity growth in nondurables in the longer run will be much higher in this framework than in the standard Solow setup, where $\gamma$ is constrained to be one and is not estimated.

The estimates of $\gamma$ in Table 1 all refute the claim of my research in the late 1980s that there are short-run increasing returns to scale. All of the reported estimates of $\gamma$ are close to or below one. My failing, according to Basu and Kimball's earlier work and this paper, was a lack of adjustment for cyclical shifts in factor utilization and work effort. I think I agree. But I am a little concerned about the magnitude of the finding. The estimated values of the utilization/effort parameter $\xi$ are around one. Is it plausible that a one percent increase in hours is associated with a one-percent increase in effort and a one-percen increase in capital utilization? That's what it takes to believe these results. I'm still not completely persuaded, though I certainly believe that this is a meritorious approach.

The paper argues, effectively in my view, that the relevant measure of aggregate productivity growth is the weighted average of the disaggregated measures, not the result of applying the Solow formula to the aggregate data. Although Solow productivity measures aggregate neatly, so it does not make a difference whether you measure and aggregate or aggregate and measure, the same is not true of productivity measures corrected for returns to scale/market power and for adjustment costs.

One aspect of the calculations not stressed by the authors is the wide range in productivity growth they find across industries. The figure below, based on data kindly supplied by the authors, shows that 7 of their industries actually had productivity regress over the period from 1988 through 1999.

These questions about the results do not detract from the accomplishments of an important paper. They only demonstrate the benefits from further research on this important topic.