Taking Account...

A new method to measure R&D output prices

While the role of research and development (R&D) in the economy has generated a vast literature, relatively little attention has been paid to how R&D should actually be measured. In a recent paper available on the BEA Web site, BEA economists Dennis Fixler and Adam Copeland suggest a new framework for estimating R&D output and output prices, thus allowing for a time series of real output.

The issue is timely, as the Bureau of Economic Analysis (BEA) works to refine its R&D satellite account with an eye on incorporating R&D spending as an investment in its national accounts beginning in 2013.

Fixler and Copeland's approach starts with a model of profit-maximizing innovators that develop R&D output that is sold to downstream firms. They then use the model to analyze the determinants of R&D output prices and price changes. A key result is that the price of an R&D innovation is equal to the change in the downstream firm's profits attributable to the adoption of the R&D innovation.

Because of data limitations, the authors applied this approach to the scientific R&D services industry. The industry closely fits the model because the primary source of receipts for these establishments is the sale of R&D services. Further, more than 70 percent of establishments in the industry are single-unit establishments, which dovetails well with the model. Compared with the pharmaceutical or semiconductor industries, the scientific R&D services industry provides a relatively clean look at the production of innovation.

However, even with the Census Bureau data, the authors did not have enough information to directly apply the model to estimate R&D output prices. In general, this is difficult because R&D output prices reflect future profit flows attributable to new R&D.

Accordingly, the authors used an indirect measure of R&D output price changes. Using industry revenue data with appropriate quantity indexes, they constructed an R&D output price index that showed an average annual price change of 5.81 percent between 1987 and 2005. Over this period, the growth rate of price change decelerated; for the first half of the period, the average annual price change is 6.53 percent, while in the second half it is 5.01 percent. Using the index, the authors also found that scientific R&D services' real revenues grew at an average annual rate of 2.64 percent.

Because the output of these establishments typically contributes to one-quarter of total R&D expenditures, the deflation of nominal output has large effects on real total R&D expenditures. For total R&D expenditures, the authors developed a two-price-index approach. For R&D expenditures for which there are market-based data, they used their output-based price index. For those R&D expenditures without any market-based data, about three-fourths of the total, they used an aggregate input-cost price index, which is commonly used as a deflator for R&D expenditures. Their approach stands in contrast to the traditional method of only using an input-cost price index.

The difference was notable. Using only an aggregate input-cost price index to deflate nominal total R&D expenditures dramatically overstated the average growth rate of real total R&D expenditures.

Over an 18-year period, using only an aggregate input-cost price index overstated the level of real total R&D expenditures by 14 percent, the authors found.

Budget translation article coming in June

The annual article that provides federal government statistics based on the proposed budget of the U.S. government will appear in the June issue of the Survey of Current Business.

Traditionally, this article appears in the March issue. However, this year, the detailed 2010 federal budget will be released later than usual, necessitating a later publication date. Every year, BEA provides this article to allow for more detailed analysis of the macroeconomic effects of the budget.