Taking Account...

BEA study derives industry R&D price indexes

Research and development (R&D) and other intangibles are widely understood to make significant contributions to economic output and growth. Estimating R&D for national economic accounting purposes calls for R&D price indexes suitable to deflate nominal measures of R&D output.

A recent paper by Bureau of Economic Analysis (BEA) economists Carol Robbins, Olympia Belay, Matthew Donahoe, and Jennifer Lee describes the construction of experimental industry-specific R&D price indexes to deflate nominal R&D output and investment in the absence of market prices and quantity measures.

Indexes were constructed for pharmaceutical manufacturing, semiconductor manufacturing, motor vehicle manufacturing, computer system design and related services, and scientific R&D services.

Building from a standard input cost approach recommended by the Organization for Economic Co-operation and Development (OECD) for intangible capital, the authors constructed price indexes that included an adjustment for the unobserved productivity of the innovator.

Their model holds that the growth rate of R&D output can, on average, be best understood by the growth rate of R&D inputs plus the growth rate of R&D productivity. The challenge is to identify the growth rate of this R&D productivity using data available on an ongoing basis.

The experimental indexes are based on industry cost weights from National Science Foundation (NSF) R&D expenditure data, wages from the Bureau of Labor Statistics (BLS), and intermediate input data from BEA. These cost weights encompass wages for scientists and engineers, wages for support personnel, materials and supplies costs, current-cost depreciation, and other R&D costs.

To adjust for the unobserved productivity in the knowledge-creation process, the authors use BLS multifactor productivity for the nonfarm business sector.

The study also compared the authors' data-intensive approach that estimates R&D costs separately for the five specific industries with an approach that uses a common deflator.

The authors calculated that the weighted average of productivity-adjusted input cost indexes for R&D increased at an average annual of 1.2 percent between 1998 and 2007. This compares with a growth rate of R&D input costs of 2.7 percent and a growth rate of the gross domestic product (GDP) price index of 2.4 percent.

The authors also concluded that using a common deflator for the R&D of different industries matters for growth measurement primarily at the industry level. Not surprisingly, the use of a common deflator for R&D investment implies more rapid R&D investment growth for industries that have experienced relatively rapid increases in input costs, compared with an industry-specific deflator.

For use in deflating R&D for the national accounts, the authors concluded that at the macro level, the impact on R&D investment and GDP is not greatly affected by the choice of industry-specific or aggregate deflators. Given the tradeoff between computational complexity and precision, an aggregate deflator for business R&D has substantial appeal.

However, the impact of choosing industry-specific or aggregate deflators is more pronounced at the industry level. Because the authors used a single productivity adjustment for all industries, the variation across industries in the price indexes is a function of input cost variation.

This variation in input costs was substantial: their input cost index for semiconductor-related R&D rose at an average annual rate of 2.1 percent between 1997 and 2007 while the input cost index for scientific R&D services rose at a rate of 3.1 percent.

The greatest difference between industry-specific and aggregate deflators shows up in industries where labor and other input costs have a different growth rate from the single index chosen.