

Taking Account...

BEA paper offers new R&D depreciation model

In an increasingly knowledge-based U.S. economy, accurately measuring intangible assets, including research and development (R&D) assets, remains an essential component of measuring overall economic growth.

In fact, measuring the impact of intangible assets on economic growth has long been one of the more vexing issues in economic growth accounting. And one of the most pressing challenges involves the measurement of the depreciation rate of intangible assets, including R&D assets.

Experts in this field have concluded that accurate measurement of R&D depreciation is the central unresolved problem in the measurement of the rate of return to R&D.

The critical measurement issues arise from the fact that both the price and the output of R&D investment are generally unobservable. Additionally, there is no arms-length market for most R&D assets, and the majority of R&D capital is developed by firms for their own use. Moreover, unlike tangible capital, which depreciates partly because of physical decay or wear and tear, business R&D capital depreciates mainly because its contribution to a firm's profit declines over time.

The driving forces are obsolescence and competition, both of which reflect individual industry technological and com-

petitive environments.

Contributing to the recent literature on this issue, Wendy C.Y. Li, of the Bureau of Economic Analysis (BEA), and Bronwyn H. Hall, of the University of California at Berkeley and the National Bureau of Economic Research, develop a forward-looking profit model to estimate the depreciation rates of business R&D capital.

The model uses only data on R&D investment and industry output in concert with a few simple assumptions on the role of R&D in generating profits for the firm to calculate not only industry-specific constant R&D depreciation rates but also time-varying rates.

These estimates are the first complete set of R&D depreciation rates derived for major U.S. high-tech industries.

The new estimates are consistent with the main conclusions of other recent studies, which generally agree that R&D depreciation rates in general are higher than the traditionally assumed 15 percent and vary widely across industries.

In addition, the relative ranking of the constant R&D depreciation rates among industries is consistent with industry observations, and the industry-specific time-varying rates are informative about the dynamics of technological change and the levels of competition across industries.

The method also provides a consistent and reliable way to

perform cross-country comparisons of R&D depreciation rates, which can inform countries' relative paces of technological progress and technological environments.

The new model demonstrates the feasibility of estimating R&D depreciation rates from industry data. The authors' model was applied to two different datasets, one for firms and one for industries.

The first dataset was constructed from Compustat SIC-based firm-level sales and R&D investments in 10 R&D intensive industries. The authors used this dataset to calculate constant R&D depreciation rates for all 10 R&D intensive industries identified in BEA's R&D satellite account (which is available on the BEA Web site).

The second dataset contains BEA-National Science Foundation NAICS-based establishment-level industry output and R&D investments in the 10 R&D intensive industries.

The authors also present a cross-country comparison of the R&D depreciation rates between the United States and Japan and find that the results reflect the relative technological competitiveness in key industries.

(This summary uses language from the paper itself. It was prepared by staff members of the SURVEY OF CURRENT BUSINESS in conjunction with the paper's authors. The paper is available on the BEA Web site at no charge.)