

Investment and capital services

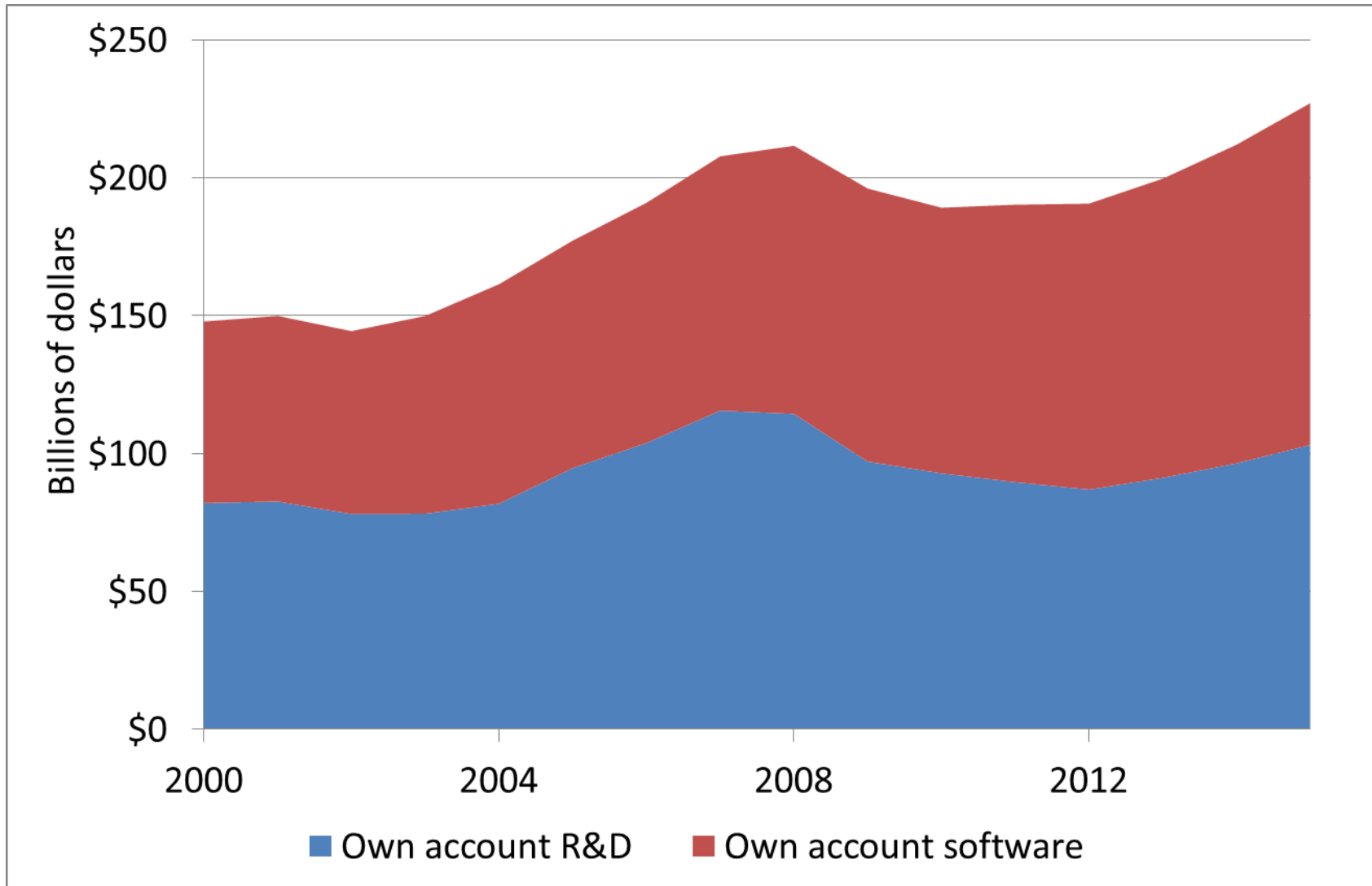


Two improvements for the 2018 comprehensive update:

- Incorporate capital services into the estimates of own-account investment in software and R&D
- Re-classify software R&D from software investment to R&D investment

- Own-account investment is performed by a business in-house for its own use
 - A portion of software, R&D, entertainment originals, and construction investment is own-account
- BEA estimates investment in own-account R&D and software using a “sum of costs” approach
 - Production costs include compensation, intermediate expenses, depreciation
 - BEA’s estimates currently exclude an estimate of “capital services”

Private own-account investment in software and R&D



- Capital services measure the flow of production coming from the stock of fixed assets
 - Depreciation
 - Net return
- The 2008 SNA recommends including the value of capital services when estimating output for own final use
 - A3.41 ...when estimating the value of the output of goods and services produced by households and corporations for own final use, it is appropriate to include a return to capital as part of the sum of costs when this approach is used for estimating output in the absence of comparable market prices.

- Capital services (from Christensen and Jorgenson, 1969):

$$S_{a,i,t} = q_{a,i,t} * K_{a,i,t-1}$$

- $S_{a,i,t}$ is the capital service flow of an asset
 - $q_{a,i,t}$ is the capital service price of an asset
 - $K_{a,i,t-1}$ is the real net stock of an asset (from the fixed assets accounts or FAAs)
 - Estimated for asset a , industry i , time t
- The capital service price or rental price (q) of a capital asset equals the discounted flow of services

$$q_{a,i,t} = p_{a,i,t-1}r_{i,t} + p_{a,i,t}\delta_a - (p_{a,i,t} - p_{a,i,t-1})$$

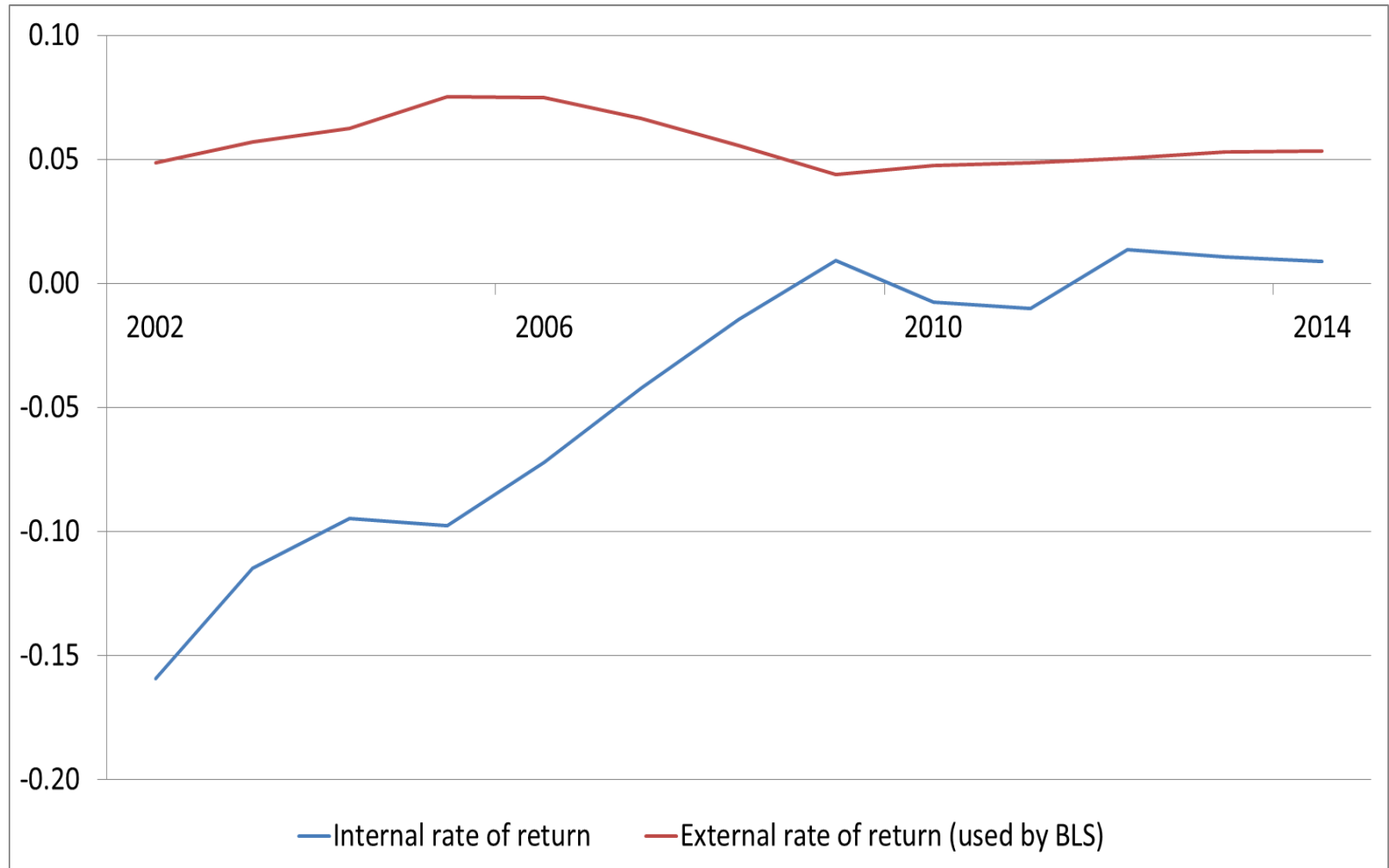
- $p_{a,i,t}$ is the price of a new asset (from the NIPAs)
- $r_{i,t}$ is the rate of return
- δ_a is the depreciation rate (from the FAAs)

- Option 1: Internal rates of return:

$$r_{i,t} = N_{i,t} / [K_{eq+st+ipp,i,t}]$$

- $r_{i,t}$ is the rate of return of industry i at time t
 - $N_{i,t}$ is the net operating surplus of industry i , at time t
 - $K_{i,t}$ is the current cost stock of fixed assets (equipment, structures, intellectual property) for industry i , at time t
 - Additional adjustments added for the effects of taxes, self-employed income etc.
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- Option 2: External rates of return, obtained from BLS productivity accounts

Internal and external rates of return: NAICS 5415



Source: BLS



- Continue to estimate own-account investment as the sum of costs
- Replace depreciation with estimates of capital services
- Detailed estimates performed in benchmark years

- The addition of capital services to own account investment will...
 - Improve consistency with international standards
 - Provide more complete estimates of the opportunity cost of own account investment
 - Provide improved measures of sources of economic growth and productivity
 - Contribute to the literature on measuring own-account investment and intangibles

- Own-account software currently includes the development of software originals, which is similar in concept to own-account software R&D

- Proposed new approach
 - Re-classify software R&D from software to R&D
 - New approach is conceptually appealing and will lead to more consistent estimates of R&D spending from BEA and NSF
 - Reconcile NSF-based software R&D with software originals reflected in own-account software