R&D SATELLITE ACCOUNT: Preliminary Estimates

Comments By
Charles Hulten
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EXPANDING GDP/GDI TO INCLUDE R&D EXPENDITURES

• R&D outlays are currently expensed; capitalization expands size of GDP/GDI
• Capitalizing R&D is both complicated and hard to do
  - move into area with which there is limited precedent and experience
  - involves valuation of an asset for which there is no market price
STRONG EFFORT BY BEA

• Congratulations and praise due to BEA for making significant progress on a host of complex issues

• More remains to be done as the paper itself points out, including
  - Some large conceptual issues
  - Many smaller technical issues
  - Improved exposition
FOCUS ON LARGER ISSUES

• The rate of return to both R&D and tangible capital
• The “ownership” of R&D problem
• The definition and scope of R&D
• R&D price deflators
1. Rate of Return Issues

GDP/GDI Without Intangibles:

\[ p_Q Q_t = p^L_t L_t + \ p^K_t K_t = p^L_t L_t + (r + \deltaK) p^I_t K_t \]
GDP/GDI Without Intangibles:

\[ p^Q_t Q_t = p^L_t L_t + p^K_t K_t = p^L_t L_t + (r + \kappa) p^I_t K_t \]

With Intangibles and Common Rate of Return:

\[ p^Q_t Q_t + p^N_t N_t = p^L_t L_t + p^{K*}_t K_t + p^R_t R_t \]

\[ = p^L_t L_t + (r + \kappa) p^I_t K_t + (r + \rho) p^N_t R_t \]
With Intangibles and “Own” Rates of Return:

\[ p_{t}^{Q}Q_{t} - p_{t}^{L}L_{t.} + p_{t}^{N}N_{t} = p_{t}^{K^{*}}K_{t} + p_{t}^{R}R_{t} \]

\[ = (r_{K} + \square_{K})p_{t}^{I}K_{t} + (r_{R} + \square_{R})p_{t}^{N}R_{t} \]
\[ p^Q_t Q_t - p^L_t L_t + p^N_t N_t = p^{K^*}_t K_t + p^R_t R_t \]

\[ = (r_K + \bigcirc) p^I_t K_t + (r_R + \bigcirc) p^N_t R_t \]

\( r_R \) is estimated to be approximately 15\%. This is an exogenous *ex ante* rate of return. If the same logic is applied to \( r_K \) (an exogenous *ex ante* rate of return), there is no guarantee that the accounts will balance (GDP not equal to GDI).
If \( r_K \) is treated as an endogenous *ex post* rate of return (following Jorgenson and Griliches), you get adding-up but \( r_K \) now depends on assumptions about \( r_R \):

\[
\frac{\partial r_K}{\partial r_R} = -(\frac{p_R^t R_t}{p_I^t K_t})
\]

Increasing the assumed rate of return to R&D drives down the endogenous *ex post* rate of return to other forms of capital.
SPILLOVER EXTERNALITIES

$r_R$ is the *private* rate of return to R&D. It excludes spillover externalities of R&D knowledge. Good idea because:

- Including spillovers forces use of exogenous rate of return, $r_R$, with the problems already noted.
- Spillovers are hard to measure, and raise the issue of spillover into and out of U.S.
- Spillovers tend to be “competed away” in lower product prices.
- Ignoring spillovers puts effects into MFP residual (as in Lucas/Romer).
Some Suggestions …

• COMPUTE IMPLIED RATES OF RETURN TO TANGIBLE CAPITAL UNDER THE DIFFERENT SCENARIOS AND ASSUMPTIONS

• COMPUTE STATISTICAL DISCREPANCY IF EXOGENOUS RATES OF RETURN ARE USED FOR BOTH TANGIBLES AND R&D
This would help illustrate a larger point:

- When BEA moves to incorporate a complete production account into the NIPAs, the issue of the rate of return becomes all important.

- This is not apparent right now because there is no production account, and hence no explicit $r_K$. This rate of return is, however, implicit.
Thus …

• BEA should *not* make piecemeal improvements in the NIPA, like the R&D satellite account, without considering its longer range goals for the future structure of the NIPA

• Old sins cast long shadows
2. The “ownership” of R&D problem

• Paper makes the distinction between the “funder” of the R&D and the “performer”
• Assumes the government owns all of the R&D that it funds
• Potential asymmetry between R&D and tangible capital on ownership/use issue
Compare Investment in (1) Equipment, (2) Own-Account R&D, and (3) Govt. funded R&D

• Funder
• Performer
• Owner
• User
3. The definition and scope of R&D

- BEA uses Frascati definition of R&D
- Includes “social science” and “humanities” R&D in addition to “scientific” R&D
- Doesn’t in R&D for “commercialization”
- Doesn’t including broad list of intangibles, as in Corrrrado, Hulten, and Sichel
$1 trillion of Intangible Investment

- COMPUTERIZED INFORMATION ($154,$154)
  - COMPUTER SOFT WARE ($151)
  - COMPUTERIZED DATABASES ($3)

- SCIENTIFIC PROPERTY ($424,$424)
  - SCIENTIFIC R&D ($184)
  - MINERAL EXPLORATION ($18)
  - COPYRIGHT AND LICENCE COSTS ($75)
  - OTHER PRODUCT DEVELOPMENT (FINANCE, ARCHIT.) ($149)

- ECONOMIC COMPETENCIES ($642,$505)
  - BRAND EQUITY (ADVERTISING) ($236)
  - FIRM-SPECIFIC HUMAN CAPITAL (TRAINING) ($116)
  - ORGANIZATIONAL STRUCTURE MANAGEMENT CONSULTING, PLANNING ETC.) ($291)
4. R&D price deflators

- One of the hardest problems to crack, since own-account R&D leaves no objective price foot prints
- Cost-based deflators clearly inadequate because they ignore increased productivity in the research process
- The use of four scenarios is one of the strongest points of the paper
- More work needs to be done
BEA Alternative Scenarios for R&D Deflator

Index (2000 = 100)
CONCLUSION:

• VERY GOOD START ON A HARD PROBLEM.
• BETTER EXPOSITION
• CONSIDERATION OF HOW THE CHOICES MADE ABOUT THE R&D SATELLITE ACCOUNT FIT INTO THE FUTURE STRUCTURE OF THE NIPAs
• EXTENSION OF THE R&D SATELLITE ACCT. TO INCLUDE OTHER INTANGIBLES
• PROGRESS ON MANY “SMALL” TECHNICAL ISSUES