

CAPITALIZING R&D
An Idea Whose Time Has Arrived

Comments By
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WHAT'S AT STAKE

**A CONCRETE EXAMPLE
OF AN R&D
INTENSIVE COMPANY**

Modified Corporation Income Statement
MERCK 2004
(Billions of \$)

Revenues	\$22.9
Cost of Sales	- \$3.7
SG&A	- \$7.3
R&D expenditure	- \$4.0
Other Inc. (interest)	+ \$1.4
Gross Income	= \$9.2
Depreciation	- \$1.3
Before-Tax Profit	= \$8.0
Taxes	- \$2.2
After-Tax Profit	= \$5.8
Dividends	\$3.3
Retained Earnings	\$2.5
EPS	\$2.62
Total Assets	\$42.6
Shareholder Equity	\$17.2

IS THIS ALL THAT THERE IS TO MERCK AS A COMPANY?

“You see the productivity revolution everywhere except in the productivity data.”

Solow 1987

“You see the genomics revolution every except in the GDP data.”

The Current Equivalent

Modified Corporation Income Statement
 MERCK 2004
 (Billions of \$)

	<i>Conventional</i>	<i>R&D Corrected</i>
Revenues	\$22.9	<i>\$26.9</i>
Cost of Sales	- \$3.7	- \$3.7
SG&A	- \$7.3	- \$7.3
R&D expenditure	- \$4.0	- \$4.0
Other Inc. (interest)	+ \$1.4	+ \$1.4
Gross Income	= \$9.2	= <i>\$13.2</i>
Depreciation	- \$1.3	- <i>\$3.3</i>
Before-Tax Profit	= \$8.0	= <i>\$9.9</i>
Taxes	- \$2.2	- \$2.2
After-Tax Profit	= \$5.8	= <i>\$7.8</i>
Dividends	\$3.3	\$3.3
Retained Earnings	\$2.5	<i>\$4.5</i>
EPS	\$2.62	<i>\$3.51</i>
Total Assets	\$42.6	<i>\$58.1</i>
Shareholder Equity	\$17.2	<i>\$32.7</i>

REMARKS

- NEED R&D *OUTPUT* PRICE DEFLATOR TO CONSTRUCT CONSTANT PRICE ACCOUNT
- NEED ESTIMATE OF R&D GESTATION LAG TO ACCOUNT FOR TIME VALUE OF MONEY
- NEED DEPRECIATION RATE FOR BOTH INCOME STATEMENT AND BALANCE SHEET
- PROBLEM OF EXTERNALITIES

THESE ARE BIG PROBLEMS

- ARE THEY SO BIG THAT THE IT'S NOT WORTH THE EFFORT?
- ACCOUNTING PRACTICE HAS TRADITIONALLY CONCENTRATED AND MARKET DATA AND AVOIDED MAKING IMPUTATIONS WHERE POSSIBLE.
- KEYNES: "IT'S BETTER TO BE IMPRECISELY RIGHT THAN PRECISELY WRONG"

Economic Theory Strongly Favors Treating R&D as an Investment

- Standard Intertemporal Optimization indicates that investment is deferred consumption
- Symmetry Case for Intangibles: a tangible expenditure that is intended to increase future output and consumption is investment, so is an intangible expenditure that does the same

Micro Economic Theory Also Favors Capitalizing R&D

- A firm is more than a simple transformation of input into output via production function in order to maximize profit
- A firm is an organization that persists over time, in order to maximize wealth, and therefore invests in productive tangible capacity and also makes firm-specific intangible investments in itself
- Capitalization leads to better dynamics



Grab your iPod, flip it over, and read the script at the bottom. It says: "Designed by Apple in California. Assembled in China." Where the gizmo is made is immaterial to its popularity. It is great design, technical innovation, and savvy marketing that have helped Apple Computer sell more than 40 million iPods. Yet [current accounting practice] reduces Apple -- one of the world's greatest innovators -- to a reseller of imported goods."

Intangible Capital and Economic Growth

Carol Corrado, Charles Hulten, and Daniel
Sichel*

October 2005

\$1 trillion of Intangible Investment U.S. nonfarm business, 1998-2000

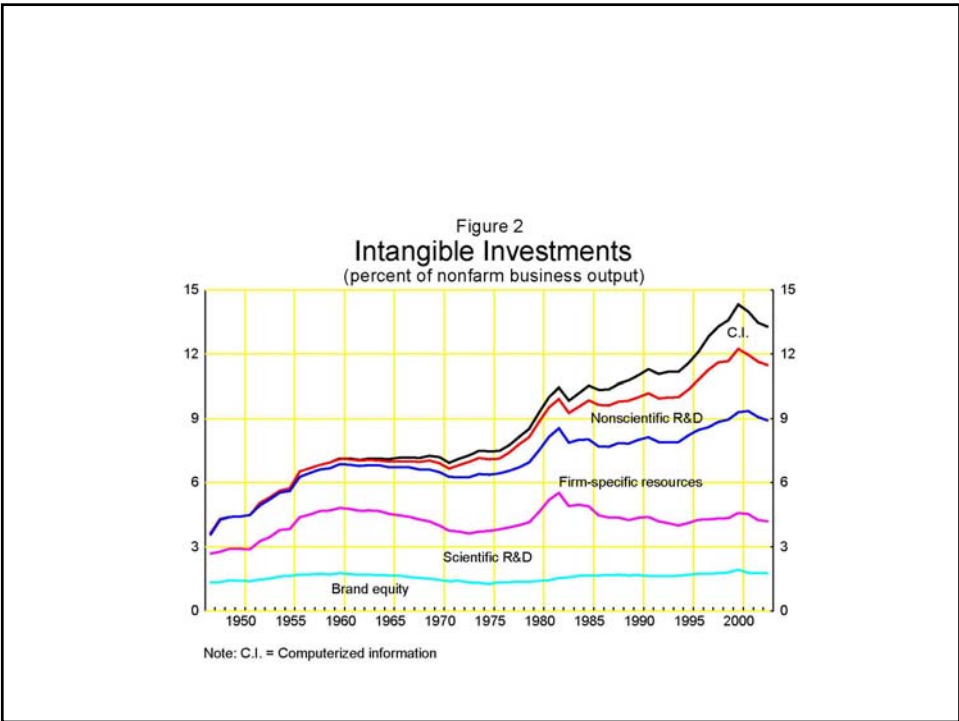
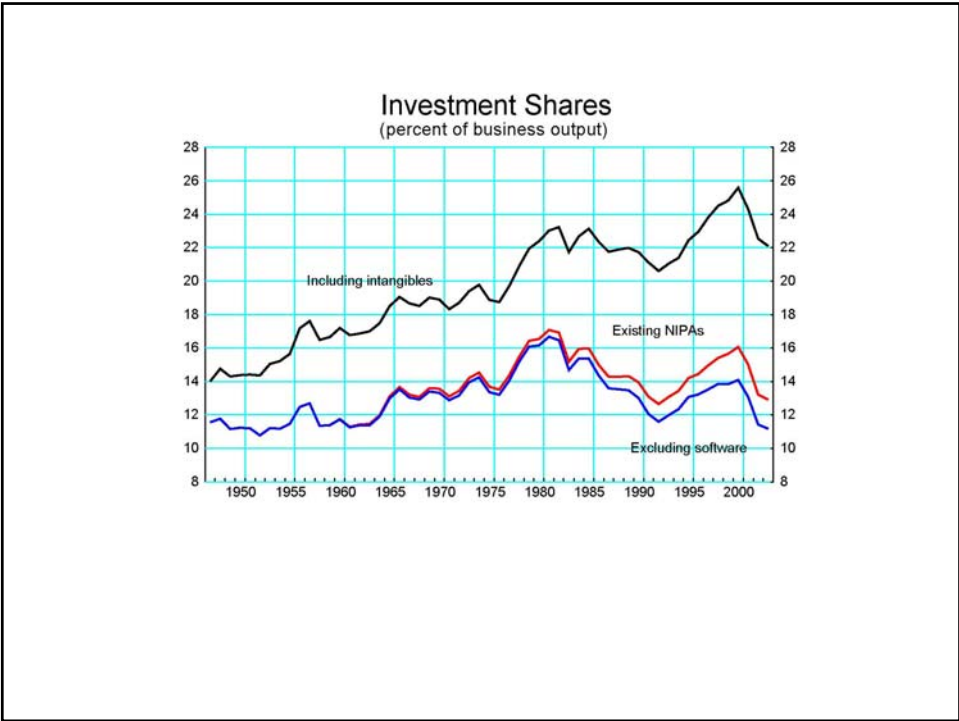
- COMPUTERIZED INFORMATION (\$154,\$154)
 - COMPUTER SOFTWARE (\$151)
 - COMPUTERIZED DATABASES (\$3)
- SCIENTIFIC PROPERTY (\$424,\$424)
 - SCIENTIFIC R&D (\$184)
 - MINERAL EXPLORATION (\$18)
 - COPYRIGHT AND LICENCE COSTS (\$75)
 - OTHER PRODUCT DEVELOPMENT (FINANCE, ARCHIT.) (\$149)
- ECONOMIC COMPETENCIES (\$642,\$505)
 - BRAND EQUITY (ADVERTISING) (\$236)
 - FIRM-SPECIFIC HUMAN CAPITAL (TRAINING) (\$116)
 - ORGANIZATIONAL STRUCTURE MANAGEMENT CONSULTING,
PLANNING ETC.) (\$291)

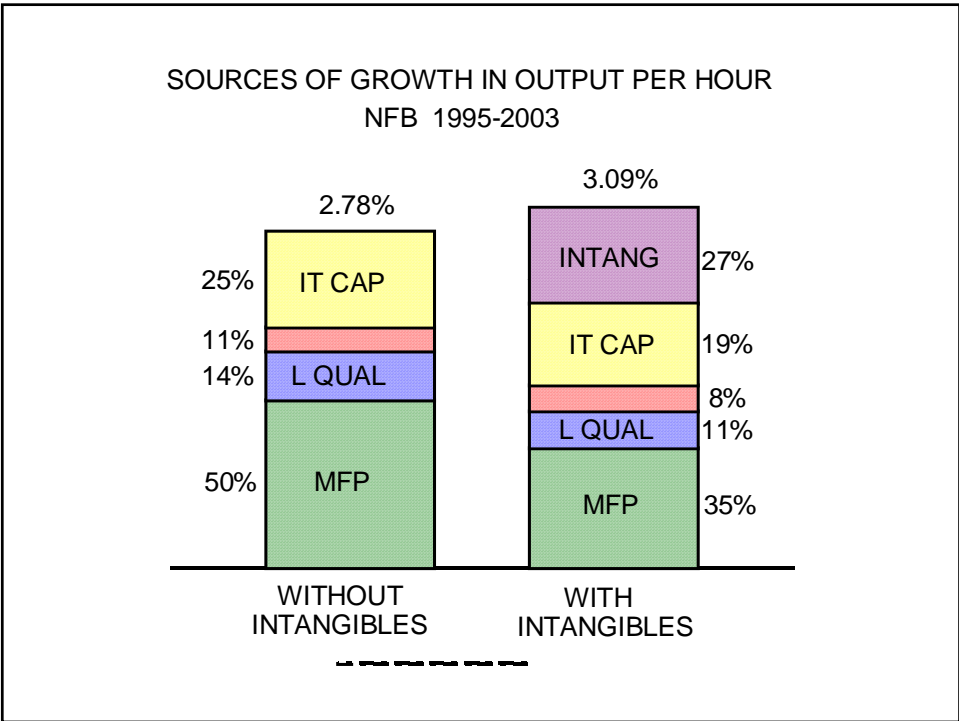
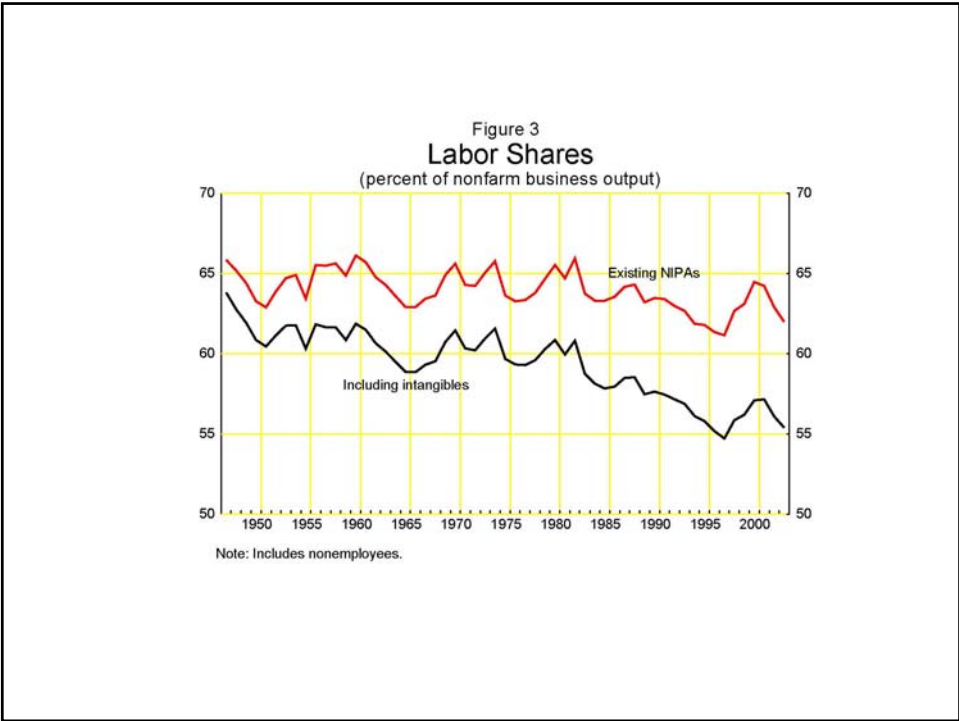
Table 4
Value of Output and Inputs,
Nonfarm business sector, 2000-2003
(annual average, billions of dollars)

	Conventional w/o Intangibles Equation (1d)	CHS (2005) w/Intangibles Equation (2d)
1. Output (P ^C C + P ^I I)	7680	7680
2. + Intangible Invest. (P ^N N)	0	1196
3. = Nominal output	7680	8876
4. - Indirect business taxes	736	736
5. - Statistical discrepancy	-52	-52
6. = Total income	6996	8192
7. Total income	6996	8192
8. = Labor compensation (P ^L L)	4915	4915
9. + Income Accruing to Tangible Capital (P ^K K)	2081	2046
10. + Income Accruing to Intangible Capital (P ^R R)	0	1231

A Longer List on Intangibles Leads to a Big Effect in 2000

- ~ \$1 trillion in “extra” investment, an amount equal to tangible investment, and \$1 trillion in “extra” GDP, a 10% increase
- a growing rate of investment
- a falling share of income for labor
- ~ \$3.6 trillion extra capital stock (PDE was around \$4.3 trillion)
- change the rate and composition of growth toward capital and ‘knowledge’





Measurement Issues

- Investment Price Deflator
- Capital Benchmark
- Depreciation Rate
- Rate of Return
- Externalities

Rate of Return

- Ex Ante versus Ex Post
- Exogenous versus Endogenous
- BLS follows Jorgenson-Griliches in using Ex Post/Exogenous Approach

Rate of Return Revisited

- Using Exogenous RofR for all capital can lead to adding-up problems
- Using Exogenous RofR for R&D, etc., and Endogenous RofR of tangible capital makes income accruing to the latter a hostage to assumptions about the former
- Including R&D externalities exacerbates the problem

Without Intangibles:

$$p^Q_t Q_t - p^L_t L_t = p^K_t K_t = (r + \delta_K) p^I_t K_t$$

With Intangibles:

$$\begin{aligned} p^Q_t Q_t - p^L_t L_t + p^N_t N_t &= p^{K^*}_t K_t + p^R_t R_t \\ &= (r + \delta_K) p^I_t K_t + (r + \delta_R) p^N_t R_t \end{aligned}$$

Externalities

- Adding externalities to the rate of return has the effect of moving them of the MFP residual since they are already in output
- Some part of the overall externality is already reflected in output price

Recommendations

- Place research emphasis on R&D output price deflator
- Use BLS/Jorgenson-Griliches ex post/ endogenous rate of return for now, think about risk premium later
- Do not include externalities
- Think about including non-scientific R&D
- 'What-if' account might also include worker training

CONTRIBUTION OF DIFFERENT INTANGIBLES
TO ANNUAL CHANGE IN LABOR PRODUCTIVITY

