

Macro v.s. Micro Comparisons of Intangible Capital: The Case of Germany and the U.S.

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Macro Comparison

Table 1: Tangible and Intangible Investment 2006

%GDP	Tangible Investment	Intangible Investment	R&D	Innovative Property	Software	Economic Competency
US	8.20	11.48	2.25	4.37	1.61	5.50
Germany	9.24	7.16	1.72	3.59	0.73	2.84

Table 2: Source of LP Growth, 1995-2006

	Output/ labor (%)	Intangibles (share)	ICT capital (share)	Non-ICT capital (share)	Labor comp (share)	TFP (share)
US	2.96	0.28	0.14	0.08	0.06	0.44
Germany	1.79	0.21	0.11	0.27	-0.08	0.49

Source: van Ark, Hao, Corrado and Hulten (2009).

Notes: Output/labor is the average annual growth rates. The other variables are percentage share of the growth rate of output per hour.



Literature Review

- Macro intangibles
 - Nakamura (1999, 2000)—first estimate of intangibles in GDP.
 - Corrado, Hulten, Sichel (2009)—first to put intangibles in source of growth analysis.
 - International comparison of sources of growth (Marrano, Haskel and Wallis, 2009, Fukao et. al. 2009, van Ark et al. 2009)
- Firm-level analysis
 - Lev (2001).
 - Hulten and Hao (2008).
 - Hulten (2010).
- This paper estimate intangibles of German companies and link firm level evidence to macro level international comparison.



Research Issues

- Are the globally-competitive companies in an economy more intangible intensive than the average company?
- Do globally-competitive companies in different countries have similar intangible investment after controlling for industry effects?



Market to Book Value Puzzle

The Puzzle

Accounting Principle: $\text{Equity} = \text{Assets} - \text{Liabilities}$

Theoretically: $\text{Equity} = \text{Market Value}$

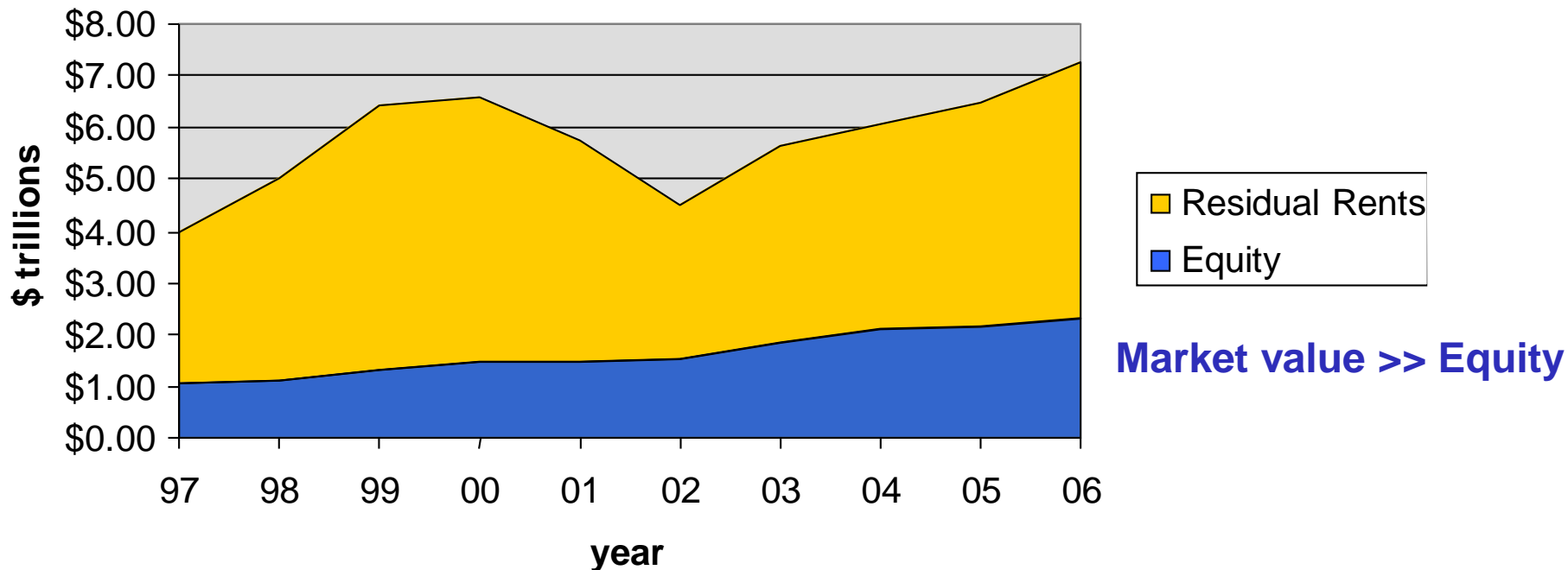
Actually: $\text{Equity} \ll \text{Market value}$

- Absence of most intangible assets from financial statements
- Expenditure on intangibles produced within a firm often treated as a current expense, not as an investment in firm's future.
⇒ No output or value created.
- No market transactions to measure the value of R&D and brand created within the company
- Difference between stock-market value of a firm and the book value of its equity treated as “goodwill” and (more or less) loosely associated with intangibles.



Book Equity Does Not explain Market Values of U.S. Companies

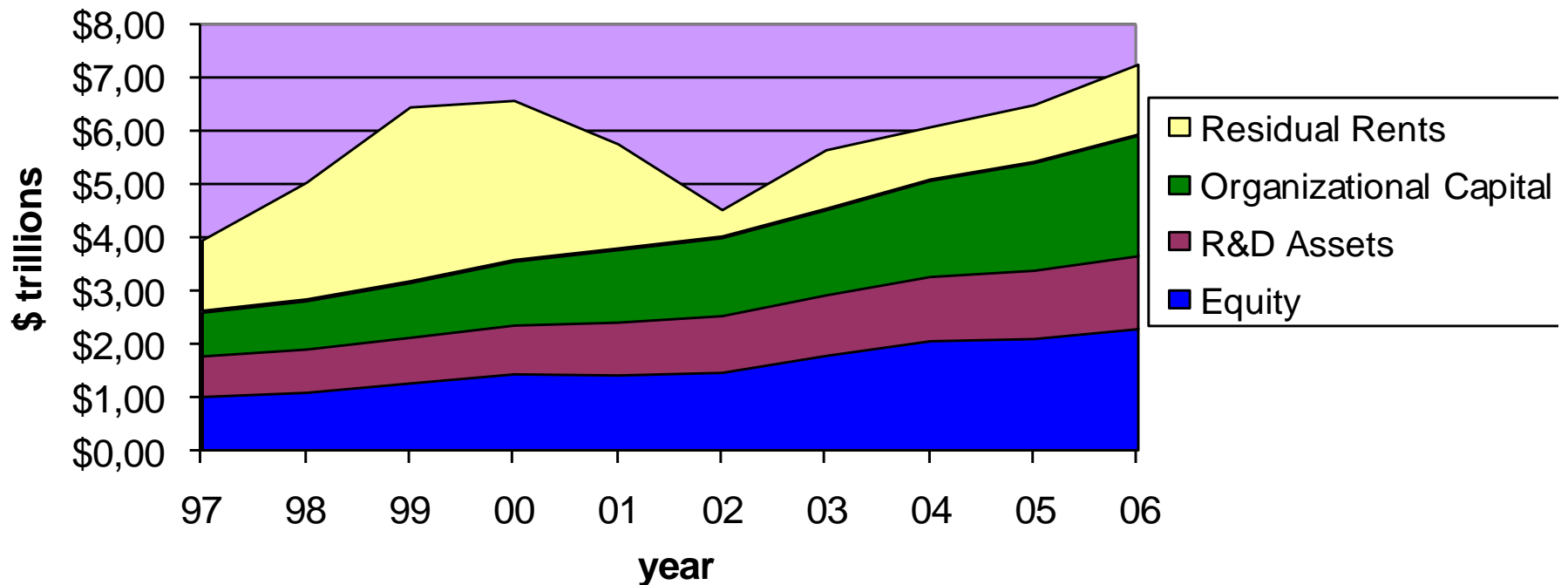
Decomposition of Stock Market Value
Selected S&P Compustat Companies
Source: Hulten-Hao (2008)





Adding Intangible Assets Can Fill the Gap

Decomposition of Stock Market Value
Selected S&P Compustat Companies
Source: Hulten-Hao (2008)





Micro Comparison

- We replicate Hulten and Hao (2008) for a sample of German/Swiss firms and compare results with the US
- Sample of 12 German/Swiss firms

Adidas AG	Merck KGaA (100)
Audi AG	Novartis AG (16)-Swiss
BASF SE (59)	SAP AG(58)
Bayer AG* (38)	Siemens AG (8)
BMW AG (31)	STADA Arzneimittel AG
Daimler AG (6)	Volkswagen AG (10)

- Data source: Financial statements of various years



Methodology

Market-to-book gap is **too large** to be attributed solely to the mismeasurement of conventional equity / vicissitudes of the stock market

- Estimate the in-house investment in R&D and organizational capital
- Include “own” intangibles on corporate financial statements
- Construct balance sheets and income statements for German/Swiss firms with and without intangibles for 10 years
- Compare traditional financial statements with “new view” balance sheets and income statements
- Focus on two statistics related to intangibles
 - Rate of investment in own intangibles (R&D and organizational capital)
 - Percentage of market value explained
- Matched-company comparisons
 - ⇒ Compare performance of German companies with US companies



Approach of the analysis

- **Traditional** balance sheet and income statement
- **New view** balance sheet and income statement:
capitalize own R&D and organizational capital
 - Estimate the cost of in-house investment in R&D
Current cost of R&D plus markup for profit (total operating surplus is allocated to R&D according to R&D's share in current expenses)
 - Estimate the cost of own production of organizational capital:
CHS procedure - translate approximate proportions of brand equity and organizational development investment into a corresponding fraction of SG&A spending (~30%)
 - Amortization of R&D and organizational capital
R&D: 10 year useful life – Organizational capital 5 year useful life
- **Comparison** of traditional and “new view” financial statements

“New View“ Income Statement – German companies

"New View" Income Statement Based on 12 Company Average 2008 (€ millions)

	Trad.	+R&D	+Org C.
1. Conventional Revenue	44,194	44,194	44,194
2. Own Production of R&D	0	2,553	2,553
3. Own Production of Org. Cap.	0	0	1,735
4. Total Adjusted Revenue (L1+L2+L3)	44,194	46,747	48,481
8. Total Current Cost (L5+L6+L7)	38,168	38,168	38,168
9. Operating Surplus (L4-L8)	6,026	8,579	10,313
10. Depreciation already accounted for	2,566	2,566	2,566
11. Amortization of Own R&D	0	2,320	2,320
12. Amortization of Own Org. Cap.	0	0	1,561
13. Adj. Operating Surplus (L9-L10-L11-L12)	3,460	3,693	3,866
15. Before-Tax Income (L13-L14)	3,009	3,242	3,415
17. After-Tax Income	2,393	2,626	2,799
18. Earnings per Share	3.34	3.67	3.91

Average of 11 German companies (Adidas, Audi, BASF, Bayer, BMW, Daimler, Merck, SAP, Siemens, Stada, and Volkswagen) + Novartis

“New view“ Balance Sheet – German companies

"New View" Balance Sheet1
Based on 12 Company Average
2008 (€ millions)

CONVENTIONAL BALANCE SHEET	Trad.	+R&D	+Org C.
2. Plant and Equipment	8,844	8,844	8,844
3. Purchased Intangibles	6,149	6,149	6,149
4. Goodwill	3,401	3,401	3,401
5. Other Assets	16,903	16,903	16,903
6. Total Assets (L1+L2+L3+L4+L5)	60,018	60,018	60,018
7. Total Liabilities	41,798	41,798	41,798
8. Equity	18,219	18,219	18,219
ADJUSTMENTS FOR OWN INTANGIBLES			
9. R&D capital	0	17,208	17,208
10. Organizational Capital	0	0	6,579
11. Assets adj. for Own Intang. (L6+L9+L10)	60,018	77,226	83,805
12. Equity adj. for Own Intang. (L8+L9+L10)	18,219	35,426	42,006
COMPANY VALUATION			
13. Market Value of Equities	38,402	38,402	38,402
17. Total Intangible Assets (L3+L4+L9+L10)	9,551	26,758	33,338
18. Tobin's equity Q (L13/L12)	2.11	1.08	0.91
19. Percent MV Value Explained (1/Q)	0.47	0.92	1.09

Average of 11 German companies (Adidas, Audi, BASF, Bayer, BMW, Daimler, Merck, SAP, Siemens, Stada, and Volkswagen) + Novartis



Comparison of Key Statistics from the U.S. and German Firm Analysis

<i>2008</i>	<i>US-633</i>	<i>US-18</i>	<i>Ger-12</i>
R&D spending/conventional revenues	0.04	0.08	0.05
R&D+Org. spending/conventional revenues	0.17	0.28	0.15
%MV explained w/o Intan	0.30	0.29	0.47
%MV explained w Intan	0.77	0.80	1.09
ROE w/o Intan	0.33	0.15	0.12
ROE w/ Intan	0.17	0.08	0.07
Debt/EQ w/o Intan	2.15	2.50	1.96
Debt/EQ w/ Intan	0.83	0.89	0.90

Source: US-633 firms are from the updated results of Hulten and Hao (2008)



Comparison of U.S. and German IT and Pharmaceutical Companies

2008	IT ¹		PHARMA ²	
	US	Germany	US	Germany
R&D Spending / Revenues	0.07	0.06	0.17	0.12
Org Spending / Revenues	0.18	0.16	0.28	0.26
EQ/MCAP w/o Intang	0.24	0.33	0.29	0.44
EQ/MCAP w/ Intang	0.69	0.96	1.00	1.13
ROE w/o Intang	0.25	0.22	0.21	0.12
ROE w/ Intang	0.13	0.07	0.11	0.08
Debt/Equity w/o Intang	1.42	2.14	1.19	1.03
Debt/Equity w/ Intang	0.49	0.73	0.34	0.40

Notes: 1. German IT Companies: SAP and Siemens; U.S. IT Companies: Oracle, Apple, Intel, IBM, HP, Cisco and EMC. 2. German+ Pharmaceutical Companies: Bayer, Merck, Stada, Novartis; U.S. Pharmaceutical Companies: J&J, Pfizer, ABT, Bristol Myer, Eli Lilly and Wyeth.



Six Group-wise Comparisons of Companies by Industry

	GE	UTX	Siemens	J&J	Bayer	Pfizer	Novartis
R&D Inv/Adjusted Revenue	0.02	0.03	0.05	0.13	0.08	0.22	0.17
ORG Inv/Adjusted Revenue	0.10	0.04	0.04	0.11	0.09	0.11	0.09
%MV explained w/o Intan	0.41	0.26	0.42	0.23	0.41	0.44	0.43
% MV explained w Intan	0.76	0.58	1.20	0.76	1.22	1.45	1.08
ROE w/o Intan	0.15	0.29	0.21	0.30	0.11	0.14	0.14
ROE w/ Intan	0.11	0.17	0.05	0.15	0.05	0.08	0.09
Debt/EQ w/o Intan	6.02	2.55	2.45	1.00	2.21	0.93	0.55
Debt/EQ w/ Intan	3.26	1.13	0.86	0.31	0.74	0.28	0.22
	Forest	Stada	Oracle	SAP	Dow	DuPont	BASF
R&D Inv/Adjusted Revenue	0.18	0.03	0.16	0.15	0.02	0.05	0.02
ORG Inv/Adjusted Revenue	0.12	0.10	0.11	0.07	0.01	0.04	0.03
%MV explained w/o Intan	0.36	0.39	0.22	0.18	0.45	0.19	0.51
% MV explained w Intan	1.01	0.78	0.52	0.58	0.83	0.64	0.96
ROE w/o Intan	0.26	0.10	0.24	0.26	0.04	0.28	0.16
ROE w/ Intan	0.18	0.11	0.20	0.15	0.04	0.06	0.10
Debt/EQ w/o Intan	0.22	1.94	1.05	0.94	2.37	4.08	1.72
Debt/EQ w/ Intan	0.08	0.97	0.45	0.30	1.28	1.28	0.91 15



Caveats

- “New view” estimates on intangibles are inaccurate.
 - ⇒ based on imputations rather than on market transactions
 - ⇒ inferred from the cost of investment
- The German sample is much smaller
 - ⇒ more prone to idiosyncratic variation
 - ⇒ more heavily weighted to the auto industry
- Differences in corporate structure & governance may matter, so accounting differences may not reflect underlying structural differences
- Different accounting system in the US and Germany:
US GAAP vs. IFRS



Treatment of R&D under US GAAP and IFRS

US. GAAP

- All costs related to research and development are expensed as incurred, with few exceptions (certain website development costs and costs associated with developing internal use software)

IFRS: IAS 38

- Differentiation between “research” and “development” costs
- Research expenses are expensed as incurred
- Development costs are capitalized if specified criteria are met
 - Development cost can be measured reliably
 - The product is technically and commercially feasible
 - Future economic benefits are probable
- Conditions for capitalization are often not satisfied in full
⇒ development costs mostly expensed



Conclusions

- Capitalized internal R&D and organizational capital \Rightarrow large impact on income statements and balance sheets both countries
- Own-intangibles appear to be more important in U.S. business, though this is not a general rule
- Current practice of largely omitting intangibles from financial statements \Rightarrow biased perspective about the drivers of company value
- Addition of internally intangibles increases the percentage of market value that can be explained by equity
- Over-explanation may be caused by our assumptions on own R&D and organizational capital
- Leading R&D oriented firms exhibit higher R&D investment rates than average firms
- Intangibles *can* explain most (or all) of the market-to-book gap does not necessarily mean that they *actually do* explain the gap



Resumé

Are the globally-competitive companies in an economy more intangible intensive than the average company?

⇒ YES

Do globally-competitive companies in different countries have similar intangible investment after controlling for industry effects?

⇒ YES