

What is a Company Really Worth? Intangible Capital and the “Market to Book Value” Puzzle in Germany

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Market to Book Value Puzzle

Equity implied by the ownership of shares (market value) exceeds the book value of shareholder equity appearing on balance sheets

- 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.



Aim of the Analysis

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

- Construct estimates of the cost-in-house investment in R&D and organizational capital
- Include “own” intangibles on corporate financial statements
- Compare traditional financial statements with “new view” balance sheets and income statements
- Narrow the gap between book value and market value
- Compare performance of German companies with US companies



12 Selected German Companies

Criterion for inclusion: joint stock company is amongst top R&D Spenders

- Adidas
- Audi
- BASF
- Bayer
- BMW
- Daimler
- Infineon
- Merck
- SAP
- Siemens
- Stada
- Volkswagen

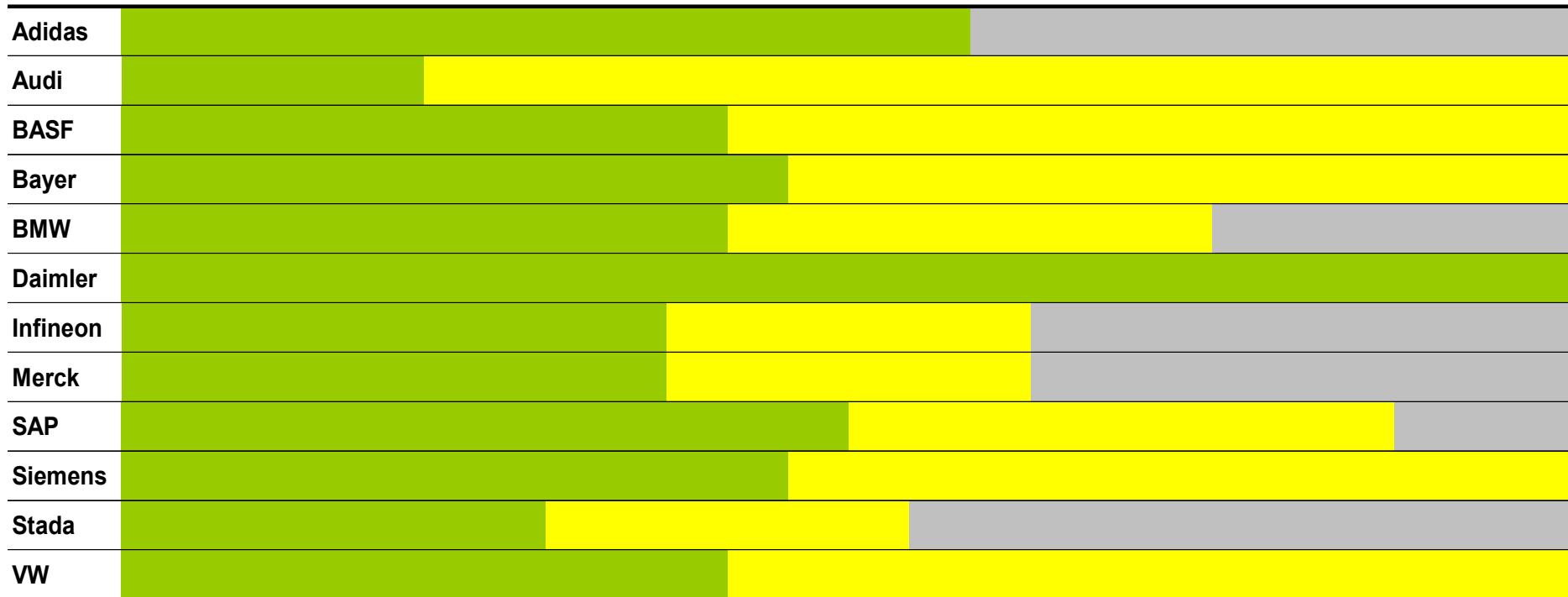
Analysed groups

1. All 12 companies
1. Pharmaceutical companies
1. Automobile manufacturers



Availability of Annual Reports

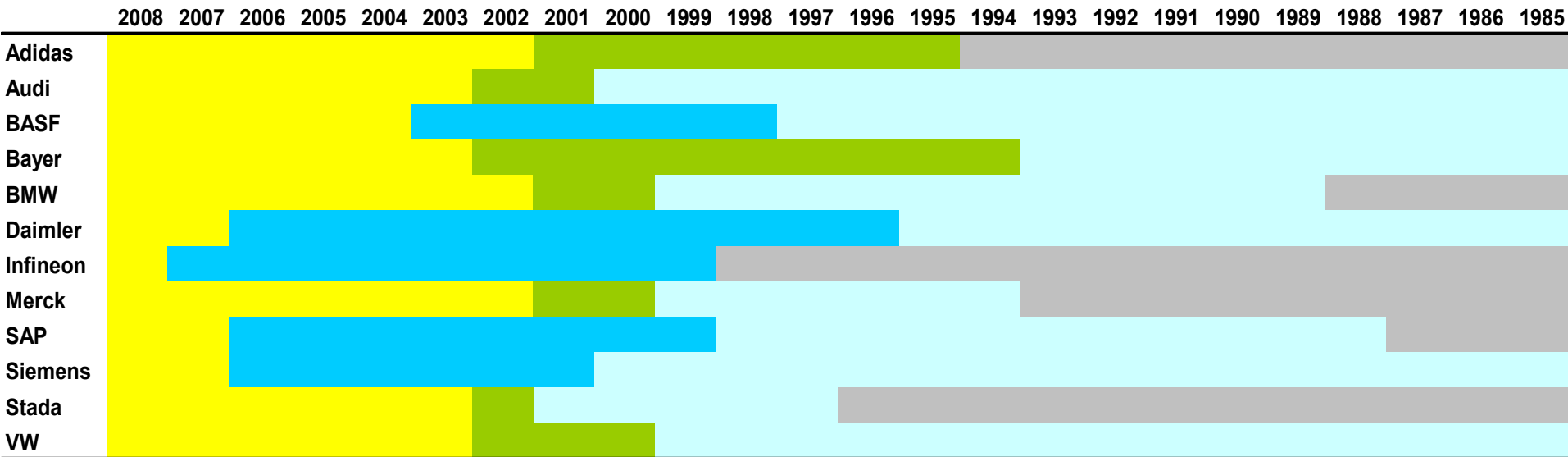
2008 2007 2006 2005 2004 2003 2002 2001 2000 1999 1998 1997 1996 1995 1994 1993 1992 1991 1990 1989 1988 1987 1986 1985



Available online
 Requested from company
 No annual report available / not traded at the stock



Accounting standards of financial statements



IFRS - International Financial Reporting Standards issued by IASB (International Accounting Standards Board) and IFRIC (International Financial Reporting Interpretations Committee)
 IAS - International Accounting Standards
 HGB - Handelsgesetzbuch (German Commercial Code)
 US GAAP - U.S. generally accepted accounting principles
 No annual report available / not traded at the stock

IFRS comprises:
 - Standards and interpretations approved by the IASB.
 - International Accounting Standards (IASs).
 - SIC interpretations.



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



US GAAP & IFRS: Areas with differences

In general, IFRS is substantial similar to US GAAP

- Inventory (IAS 2)
- Property, Plant, and Equipment (IAS 16)
- Intangible Assets (IAS 38)
- Impairment of Assets (IAS 36)

See back-up slides for more details



Approach of the analysis

- Traditional balance sheet and income statement
 - Average of all 12 German joint stock companies
 - Average of pharmaceutical companies
 - Average of automobile manufacturers
- In addition: 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

Average of 12 German companies

2008 (€ millions)	Trad.	+R&D	+Org C.
1. Conventional Revenue	42,127	42,127	42,127
2. Own Production of R&D	0	2,058	2,058
3. Own Production of org. cap.	0	0	1,453
4. Total Adjusted Revenue	42,127	44,185	45,637
5. Conventional Cost of Revenue	30,938	30,938	30,938
6. Current Cost R&D	1,744	1,744	1,744
7. Current Cost of SG&A	4,041	4,041	4,041
8. Total Current Cost	36,723	36,723	36,723
9. Operating Surplus	5,404	7,462	8,914
10. Depreciation	2,459	2,459	2,459
11. Amortization of Own R&D	0	2,078	2,078
12. Amortization of Own Org. Cap.	0	0	1,648
13. Adj. Operating Surplus	2,945	2,925	2,729
14. Net interest, etc.	-437	-437	-437
15. Before-Tax Income	2,508	2,488	2,293
16. Income Tax Paid	804	804	804
17. After-Tax Income	1,584	1,566	1,385

“New View“ Income Statement

Average of Car

2008 (€ millions)	Trad.	+R&D	+Org C.
1. Conventional Revenue	74,269	74,269	74,269
2. Own Production of R&D	0	2,671	2,671
3. Own Production of org. cap.	0	0	1,303
4. Total Adjusted Revenue	74,269	76,940	78,243
5. Conventional Cost of Revenue	59,214	59,214	59,214
6. Current Cost R&D	2,350	2,350	2,350
7. Current Cost of SG&A	3,808	3,808	3,808
8. Total Current Cost	65,372	65,372	65,372
9. Operating Surplus	8,897	11,568	12,871
10. Depreciation	4,446	4,446	4,446
11. Amortization of Own R&D	0	2,762	2,762
12. Amortization of Own Org. Cap.	0	0	1,444
13. Adj. Operating Surplus	4,451	4,360	4,220
14. Net interest, etc.	-763	-763	-763
15. Before-Tax Income	3,689	3,597	3,457
16. Income Tax Paid	1,001	1,001	1,001
17. After-Tax Income	2,607	2,515	2,375
18. Earnings per Share	5.06	4.89	4.61

“New View“ Income Statement

Average of Pharma

	2008 (€ millions)			2008 (\$ billions)		
	Trad.	+R&D	+Org C.	Trad.	+R&D	+Org C.
1. Conventional Revenue	14,041	14,041	14,041	34.24	34.24	34.24
2. Own Production of R&D	0	1,706	1,706	0.00	8.90	8.90
3. Own Production of org. cap.	0	0	1,585	0.00	0.00	4.82
4. Total Adjusted Revenue	14,041	15,746	17,332	34.24	43.14	47.95
5. Conventional Cost of Revenue	6,422	6,422	6,422	7.49	7.49	7.49
6. Current Cost R&D	1,310	1,310	1,310	5.80	5.80	5.80
7. Current Cost of SG&A	3,351	3,351	3,351	9.47	9.47	9.47
8. Total Current Cost	11,083	11,083	11,083	22.76	22.76	22.76
9. Operating Surplus	2,958	4,664	6,249	11.48	20.38	25.19
10. Depreciation	1,339	1,339	1,339	2.07	2.07	2.07
11. Amortization of Own R&D	0	1,244	1,244	0.00	4.55	4.55
12. Amortization of Own Org. Cap.	0	0	1,217	0.00	0.00	4.12
13. Adj. Operating Surplus	1,619	2,081	2,449	9.41	13.76	14.45
14. Net interest, etc.	-605	-605	-605	-2.24	-2.24	-2.24
15. Before-Tax Income	1,013	1,475	1,844	7.16	11.51	12.20
16. Income Tax Paid	287	287	287	1.79	1.79	1.79
17. After-Tax Income	722	1,184	1,552	5.37	9.72	10.41
18. Earnings per Share	1.76	3.75	5.03	2.08	3.77	4.04

“New view“ Balance Sheet

Average of 12 German companies

(€ millions)

Conventional Balance Sheet 2008

	Trad.	+R&D	+Org C.
2. Plant and Equipment	8,206	8,206	8,206
3. Purchased Intangibles	5,636	5,636	5,636
4. Goodwill	2,758	2,758	2,758
6. Total Assets	56,310	56,310	56,310
7. Total Liabilities	40,615	40,615	40,615
8. Equity	15,529	15,704	15,580

Adjustments for own Intangibles

9. R&D Capital	0	14,479	14,479
10. Organizational Capital	0	0	5,256
11. Assets adj. for own Intangibles	56,145	70,624	75,880
12. Equity adj. for own Intangibles	15,529	30,183	35,315

Company Valuation

13. Market Value of Equities	32,053	32,053	32,053
17. Total Intangible Assets	8,394	22,873	28,129
18. Tobin's Equity Qe	2.06	1.06	0.91
19. % MV value explained (1/Qe)	0.48	0.94	1.10

“New view“ Balance Sheet

Average of Car

(€ millions)

Conventional Balance Sheet 2008

	Trad.	+R&D	+Org C.
2. Plant and Equipment	14,087	14,087	14,087
3. Purchased Intangibles	6,520	6,520	6,520
4. Goodwill	0	0	0
6. Total Assets	106,820	106,820	106,820
7. Total Liabilities	65,313	65,313	65,313
8. Equity	20,143	20,143	20,143

Adjustments for own Intangibles

9. R&D Capital	0	20,713	20,713
10. Organizational Capital	0	0	5,306
11. Assets adj. for own Intangibles	106,820	127,533	132,840
12. Equity adj. for own Intangibles	20,143	40,856	46,163

Company Valuation

13. Market Value of Equities	43,351	43,351	43,351
17. Total Intangible Assets	6,520	27,234	32,540
18. Tobin's Equity Qe	2.15	1.06	0.94
19. % MV value explained (1/Qe)	0.46	0.94	1.06

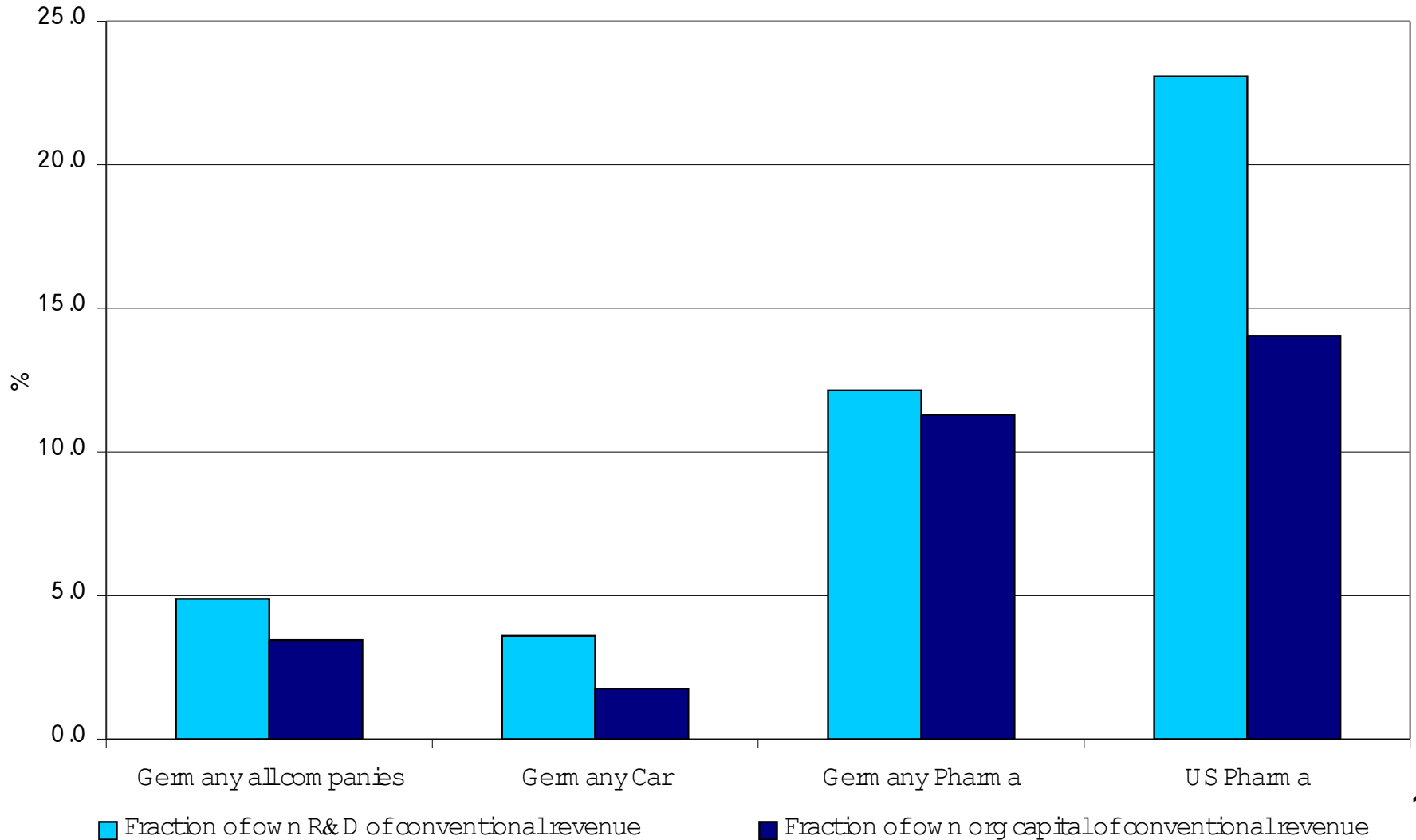
“New view“ Balance Sheet

Average of Pharma

	2008 (€ millions)			2008 (\$ billions)		
Conventional Balance Sheet	Trad.	+R&D	+Org C.	Trad.	+R&D	+Org C.
2. Plant and Equipment	4,080	4,080	4,080	10.02	10.02	10.02
3. Purchased Intangibles	7,718	7,718	7,718	6.84	6.84	6.84
4. Goodwill	3,539	3,539	3,539	9.24	9.24	9.24
6. Total Assets	23,542	23,542	23,542	56.88	56.88	56.88
7. Total Liabilities	14,627	14,627	14,627	30.93	30.93	30.93
8. Equity	8,914	8,915	8,916	25.95	25.95	25.95
Adjustments for own Intangibles						
9. R&D Capital	0	9,051	9,051	0.00	47.33	47.33
10. Organizational Capital	0	0	5,618	0.00	0.00	17.85
11. Assets adj. for own Intangibles	23,542	32,593	38,211	56.88	104.21	122.06
12. Equity adj. for own Intangibles	8,914	17,966	23,585	25.95	73.28	91.13
Company Valuation						
13. Market Value of Equities	19,761	19,761	19,761	90.97	90.97	90.97
17. Total Intangible Assets	11,258	20,309	25,927	16.07	63.40	81.25
18. Tobin's Equity Qe	2.22	1.10	0.84	3.51	1.24	1.00
19. % MV value explained (1/Qe)	0.45	0.91	1.19	0.29	0.81	1.00

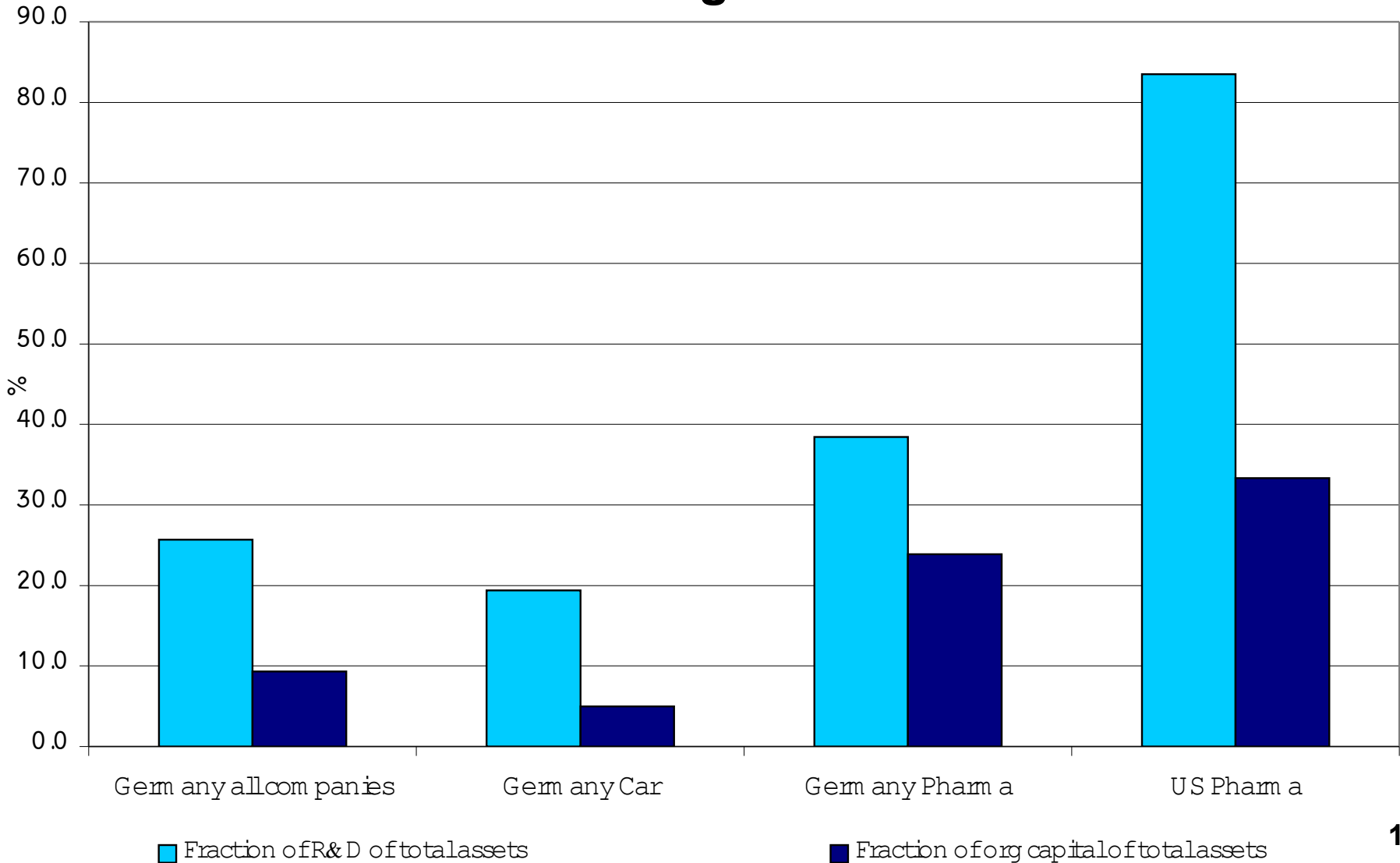


Fraction of own Intangibles of Conventional Revenue





Fraction of own Intangibles of Total Assets





Comparison of U.S. and German Companies on Several Key Dimensions I

	ALL		PHARMA	
	US '08	GER '08	US '08	GER '08
MCAP/EQ W/O INTANG	3.23	2.06	3.51	2.22
MCAP/EQ W/ INTANG	1.19	0.91	1.00	0.84
ROE W/O INTANG	0.30	0.10	0.21	0.08
ROE W/ INTANG	0.15	0.04	0.11	0.07
DEBT/EQUITY W/O INTANG	1.72	2.62	1.19	1.64
DEBT/EQUITY W/ INTANG	0.63	1.15	0.34	0.62



Comparison of U.S. and German Companies on Several Key Dimensions II

	ALL		PHARMA	
	US '08	GER '08	US '08	GER '08
R&D INV/SALES	0.04	0.06	0.26	0.12
ORG INV/SALES	0.08	0.03	0.14	0.11
R&D COST/TOTAL COST	0.04	0.05	0.25	0.12
ORG COST/TOTAL COST	0.16	0.11	0.42	0.30
CONV ASSETS/TOT ASSETS	0.60	0.74	0.47	0.62
R&D ASSETS/TOT ASSETS	0.19	0.19	0.39	0.24
ORG ASSETS/TOT ASSETS	0.21	0.07	0.15	0.15 ¹⁹



Pros and Cons of the New View

Neither the “old” nor “new” view of the income statement is uniquely correct. ⇒ First step into the right direction

- ✗ Adding $2,058 + 1,453 = 3,511$ million € (all companies) of implicit intangible income to actual sales may reveal something about the future prospects of the company, but it does not help illuminate how well the company’s product are selling in the current year, and may actually obscure this issue
- ✗ “New view” estimates of intangibles are inaccurate. They are based on imputations rather than on market transactions, and are inferred from the cost of investment
- ✓ Treating R&D as an expense can obscure a company’s true long-run position
- ✓ Expenditure on intangibles are treated as an investment in firm’s future. Output or value created.



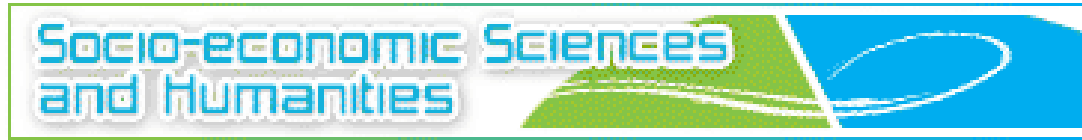
Conclusions

- Economists and accountants have tended to acknowledge the existence of intangibles in principle, but to ignore them widely in theoretical and empirical practice.
- Investment in intangibles is a key factor in determining the rate of innovation and economic growth, as well as company valuation.
- Adding the intangibles dimension to conventional productivity analysis shifts the focus away from the production of goods to the organization of the firm.



Next steps

- Explain results for German companies
⇒ Differences between 3 subgroups (all, automobile, and pharmaceutical companies)
- Why are results for German companies different from US companies?
- Estimate “new view” financial accounts for longer time-series



Back-up charts



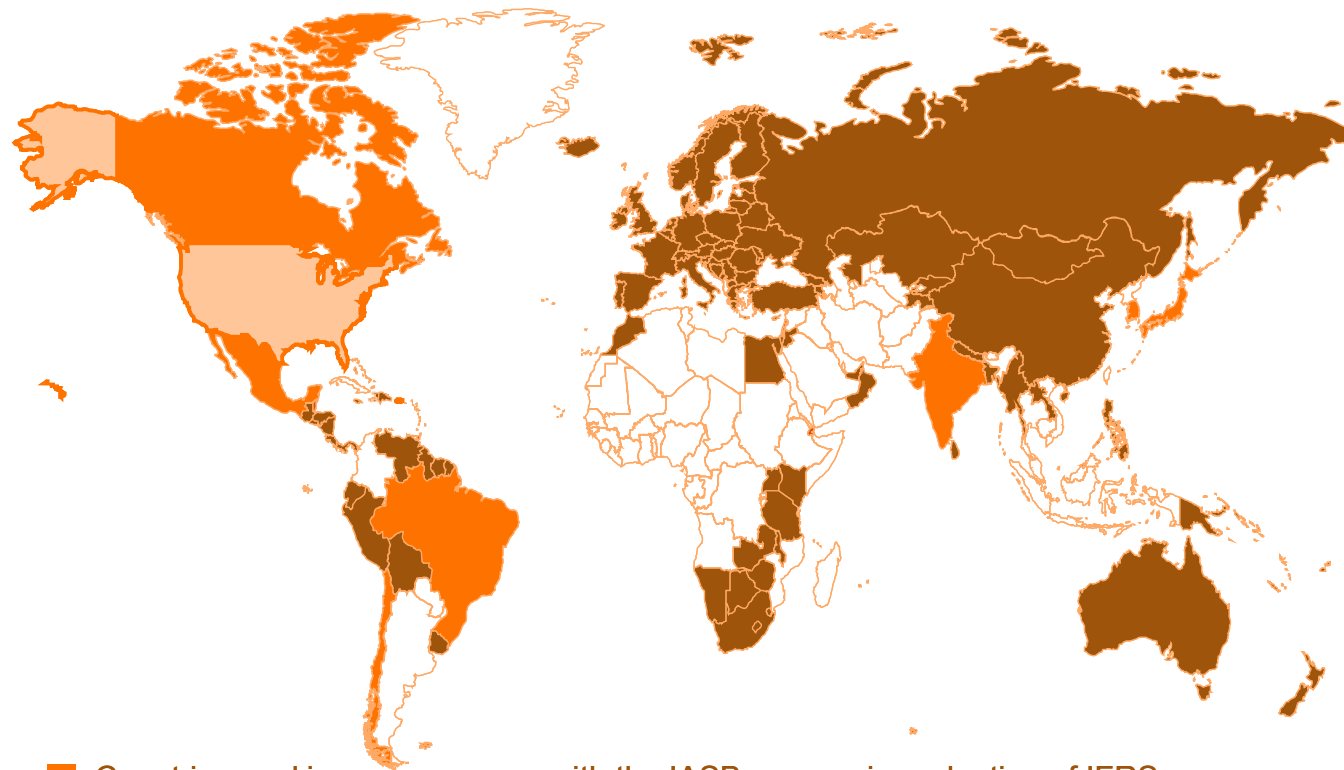
Similarities and differences between tangible and intangible capital

- Both are capital investment: both use current resources to provide for future rather than current consumption.
- **But, there are major differences...**
 - Intangibles are not a continuous input to current production.
 - They are generally produced within the company, without a market transaction.
 - They are largely invisible, they are hard to count.
 - They are largely non-rival and hard for the owner to appropriate full benefits. Only appropriable part of value if a commercial investment; the rest diffuses as reduced cost and increased TFP.



The Momentum Towards Global IFRS Adoption

More than 100 countries require or permit the use of IFRS or are converging with the IASB's standards.



- Countries seeking convergence with the IASB or pursuing adoption of IFRS
- Countries that require or permit IFRS

Top 10 Global Capital Markets	
US	US GAAP
Japan	Converting to IFRS
UK	IFRS
France	IFRS
Canada	Converting to IFRS
Germany	IFRS
Hong Kong	IFRS
Spain	IFRS
Switzerland	IFRS
Australia	IFRS



Significant differences between US GAAP and IFRS

Inventory (IAS 2)

IFRS	US GAAP
<ul style="list-style-type: none"> •Generally inventories are measured at the lower of cost and net realisable value. •Cost includes all direct expenditure to get inventory ready for sale, including attributable overheads. •Decommissioning and restoration costs incurred through the production of inventory are included in the cost of that inventory. •The cost of inventory generally is determined using the FIFO (first-in, first-out) or weighted average cost method. The use of the LIFO (last-in, first-out) method is prohibited. •Other cost formulas, such as the standard cost or retail method, may be used if the result approximates actual cost. •The same cost formula is applied to all inventories having a similar nature and use to the entity. •Net realisable value is the estimated selling price less the estimated costs of completion and sale. 	<ul style="list-style-type: none"> •Unlike IFRSs, generally inventories are measured at the lower of cost and market. •Like IFRSs, cost includes all direct expenditure to get inventory ready for sale, including attributable overheads. •Unlike IFRSs, asset retirement obligations incurred through the production of inventory are added to the carrying amount of the related item of property, plant and equipment. •Unlike IFRSs, the cost of inventory can be determined using the LIFO method in addition to the FIFO or weighted average method. •Like IFRSs, the standard cost or retail method may be used if the result approximates actual cost. •Unlike IFRSs, the same cost formula need not be applied to all inventories having a similar nature and use to the entity. •Unlike IFRSs, “market” is replacement cost limited by net realisable value (ceiling) and net realisable value less a normal profit margin (floor). Like IFRSs, net realisable value is the estimated selling price less the estimated costs of completion and sale.



Significant differences between US GAAP and IFRS

Property, Plant, and Equipment (IAS 16)

IFRS	US GAAP
<ul style="list-style-type: none"> •Property, plant and equipment is recognised initially at cost. •Cost includes all expenditure directly attributable to bringing the asset to the location and working condition for its intended use. •Cost includes the cost of dismantling and removing the asset and restoring the site. •Changes to an existing decommissioning or restoration obligation generally are added to or deducted from the cost of the related asset and depreciated prospectively over its remaining useful life. •Property, plant and equipment is depreciated over its useful life. •An item of property, plant and equipment is depreciated even if it is idle, but not if it is held for sale. •Property, plant and equipment may be revalued to fair value if fair value can be measured reliably. 	<ul style="list-style-type: none"> •Like IFRSs, property, plant and equipment is recognised initially at cost. •Like IFRSs, cost includes all expenditure directly attributable to bringing the asset to the location and working condition for its intended use. •Like IFRSs, cost includes the cost of dismantling and removing the asset and restoring the site. •Like IFRSs, changes to an existing decommissioning or restoration obligation generally are added to or deducted from the cost of the related asset and depreciated prospectively over its remaining useful life. •Like IFRSs, property, plant and equipment is depreciated over its useful life. •Like IFRSs, an item of property, plant and equipment is depreciated even if it is idle, but not if it is held for sale. •Unlike IFRSs, estimates of useful life and residual value, and the method of depreciation, are reviewed only when events or changes in circumstances indicate that the current estimates or depreciation method no longer are appropriate. •Unlike IFRSs, component accounting is permitted but not required. •Unlike IFRSs, the revaluation of property, plant and equipment is not permitted.



Significant differences between US GAAP and IFRS

Intangible Assets (IAS 38)

IFRS	US GAAP
<ul style="list-style-type: none"> •An intangible asset is an identifiable non-monetary asset without physical substance. •An intangible asset is identifiable if it is separable or arises from contractual or legal rights. •Intangible assets generally are recognised initially at cost, which is the fair value of the consideration given. •Goodwill is recognised only in a business combination and is measured as a residual. •Acquired goodwill and other intangible assets with indefinite useful lives are not amortised, but instead are subject to impairment testing at least annually. •Intangible assets with finite useful lives are amortised over their expected useful lives. •Subsequent expenditure on an intangible asset is capitalised only if the definition of an intangible asset and the recognition criteria are met. •Intangible assets may be revalued to fair value only if there is an active market. •Internal research expenditure is expensed as incurred. Internal development expenditure is capitalised if specific criteria are met. These capitalisation criteria are applied to all internally developed intangible assets. •Advertising and promotional expenditure is expensed as incurred. •Expenditure on relocation or reorganisation is expensed as incurred. •The following costs cannot be capitalised as intangible assets: internally generated goodwill, costs to develop customer lists, start-up costs and training costs. 	<ul style="list-style-type: none"> •Like IFRSs, an intangible asset is an asset, not including a financial asset, that lacks physical substance. •IFRSs, an intangible asset is identifiable if it is separable or arises from contractual or legal rights. •Like IFRSs, direct-response advertising, software developed for internal use, and software developed for sale to third parties are recognised initially at cost. Other intangible assets generally are recognised at fair value, which usually equals the fair value of the consideration given, like IFRSs. •Like IFRSs, goodwill is recognised only in a business combination and is measured as a residual. •IFRSs, acquired goodwill and other intangible assets with indefinite lives are not amortised, but instead are subject to impairment testing at least annually. •Like IFRSs, intangible assets with finite lives are amortised over their expected useful lives. •Subsequent expenditure on an intangible asset is not capitalised unless it can be demonstrated that the expenditure increases the utility of the asset, which broadly is like IFRSs. •Unlike IFRSs, intangible assets cannot be revalued. •Unlike IFRSs, both internal R&D expenditure is expensed as incurred. Special capitalisation criteria apply to direct-response advertising, software developed for internal use, and software developed for sale to third parties, which differ from the general criteria under IFRSs. •Unlike IFRSs, direct-response advertising expenditure is capitalised if specific criteria are met. Other advertising and promotional expenditure is expensed as incurred, like IFRSs. •IFRSs, certain relocation costs following a business combination are capitalised. Other relocation or reorganisation expenditures are expensed as incurred, like IFRSs. •Like IFRSs, the following costs cannot be capitalised as intangible assets: internally generated goodwill, costs to develop customer lists, start-up costs and training costs.



Significant differences between US GAAP and IFRS

Impairment of Assets (IAS 36)

IFRS	US GAAP
<ul style="list-style-type: none"> •The impairment standard deals with the impairment of a variety of non-financial assets, including property, plant and equipment, intangible assets and goodwill; investment property and biological assets carried at cost less accumulated depreciation; and investments in subsidiaries, joint ventures and associates. •Impairment testing is required when there is an indicator of impairment. •Annual impairment testing is required for goodwill, and intangible assets that either are not yet available for use or have an indefinite useful life. This impairment test may be performed at any time during an annual reporting period provided that it is performed at the same time each year. •Goodwill is allocated to cash-generating units (CGUs) or groups of CGUs that are expected to benefit from the synergies of the business combination from which it arose. •A CGU is the smallest group of assets that generates cash inflows from continuing use that largely are independent of the cash inflows of other assets or groups thereof. •Whenever possible an impairment test is performed for an individual asset. Otherwise assets are tested for impairment in CGUs. Goodwill always is tested for impairment at the level of a CGU or a group of CGUs. 	<ul style="list-style-type: none"> •Unlike IFRSs, goodwill is allocated to reporting units (RUs) that are expected to benefit from the synergies of the business combination from which it arose. •Unlike IFRSs, an RU is defined as an operating segment or one level below an operating segment. •Unlike IFRSs, an asset group is the lowest level for which there are identifiable cash flows that largely are independent of the cash flows (rather than cash inflows) of other groups of assets. •Unlike IFRSs, the carrying amount of goodwill is not grossed up for impairment testing if minority interests are present. •Unlike IFRSs, an impairment loss is recognised for assets other than goodwill and identifiable intangibles with indefinite lives only if the asset's (asset group's) carrying amount is less than the undiscounted cash flows of the asset or asset group. The impairment loss is calculated based on the fair value of the asset (asset group), unlike IFRSs. Unlike IFRSs, an impairment loss is recognised for goodwill if the fair value of the RU is less than its carrying amount, and for an indefinitely-lived identifiable intangible asset if its fair value is less than its carrying amount. •Unlike IFRSs, the cash flows used to assess recoverability are not discounted. •Unlike IFRSs, an impairment loss for an asset group is allocated pro rata to assets in the asset group, which excludes goodwill, corporate assets and indefinite-lived intangible assets. •Unlike IFRSs, the revaluation of property, plant and equipment and intangible assets is not permitted; therefore all impairment losses are recognised in profit or loss. •Unlike IFRSs, reversals of impairments are prohibited.