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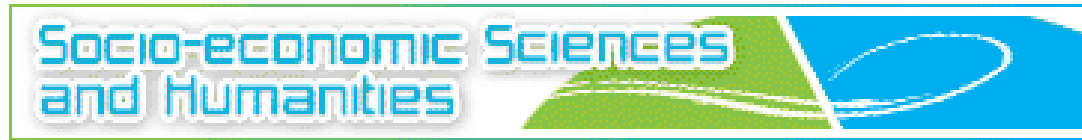
Intangible Investment and Economic Growth across Countries

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**The Conference Board

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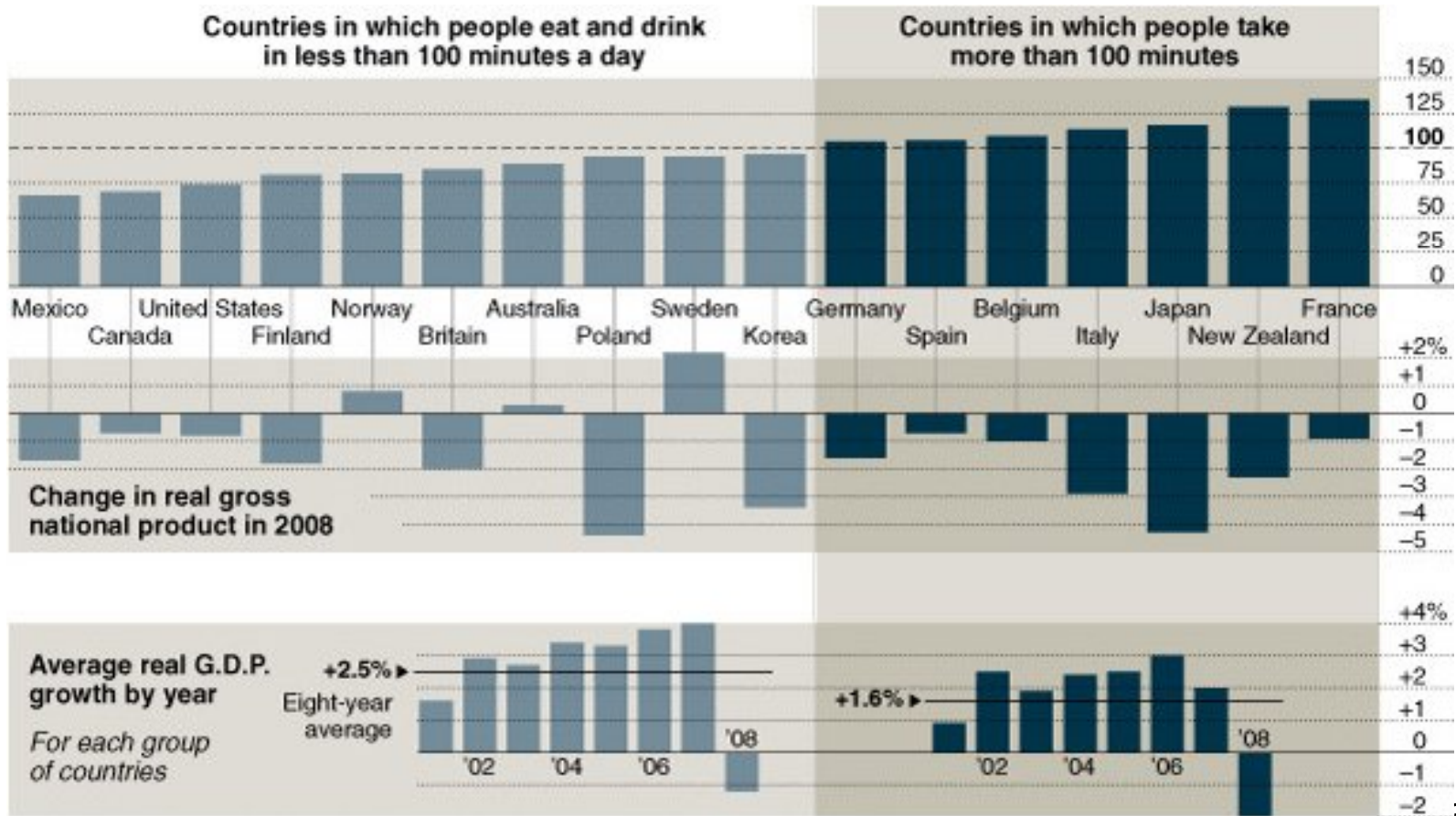


Commission on the Measurement of Economic Performance and Social Progress

- Go beyond measurement of GDP to *current well-being* and *sustainability*
- Main recommendations:
 - Look at income and consumption rather than production
 - Emphasize the household perspective
 - Consider income and consumption jointly with wealth
 - Give more prominence to the distribution of income, consumption and wealth
 - Broaden income measures to non-market activities
 - Improve measures of people's health, education, personal activities and environmental conditions
 - Quality-of-life indicators in all the dimensions covered should assess inequalities in a comprehensive way
 - Assess the links between various quality of-life domains for each person
 - Provide information needed to aggregate across quality-of-life dimensions,
 - Develop measures of both objective and subjective well-being
 - Design a well-identified dashboard of indicators for sustainability assessment
 - Do separate followup based on a well-chosen set of physical indicators to measure environmental aspects of sustainability



From GDP to broader measures of welfare ...? What approach to take?

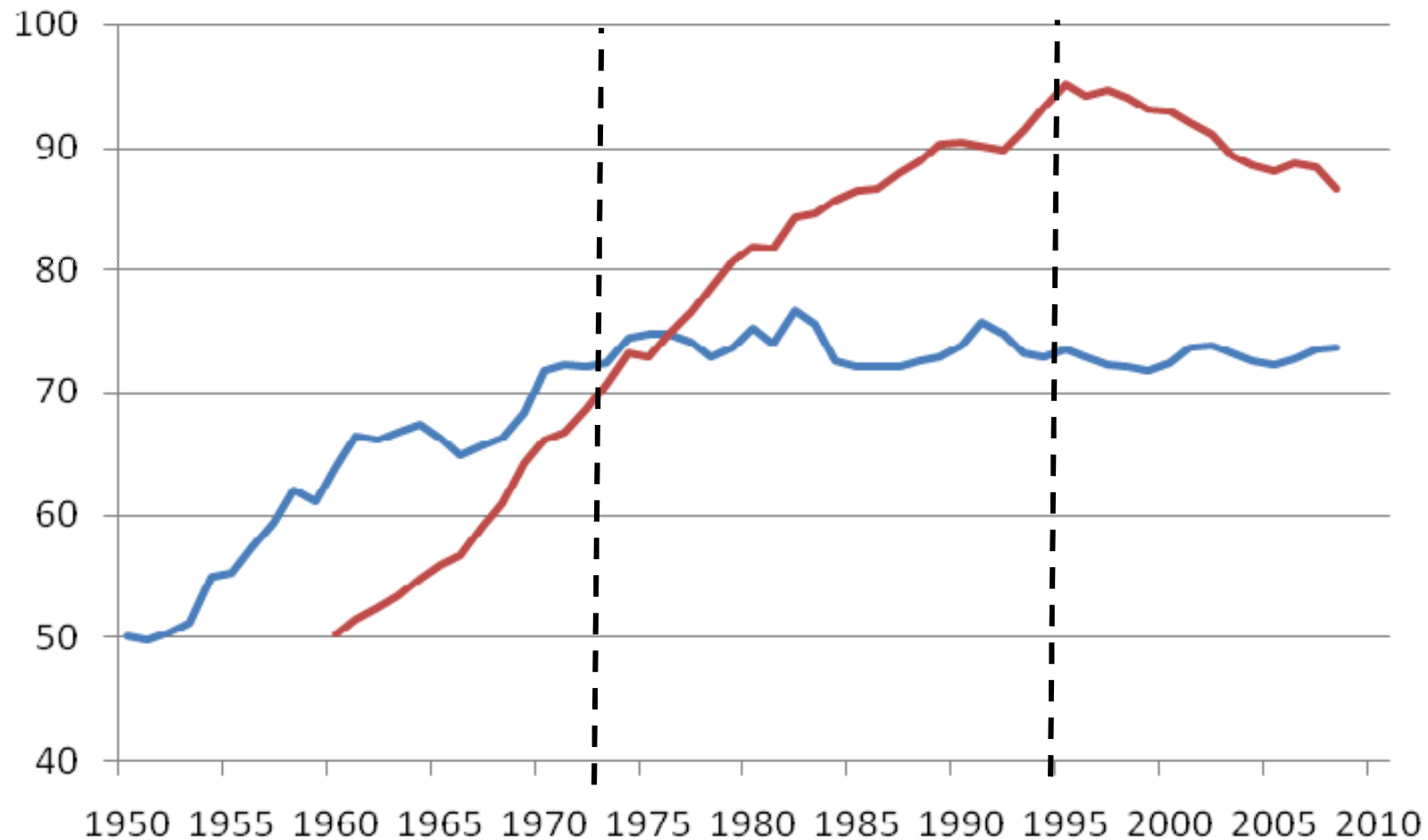


Sources: Organization for Economic Cooperation and Development; Haver Analytics

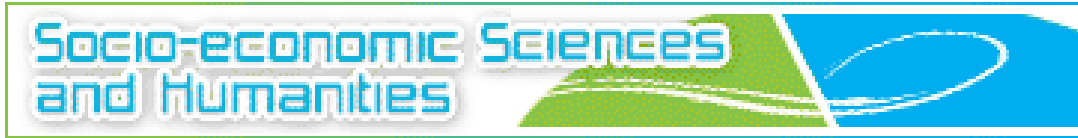


Two fundamental breakpoints in EU-US comparative performance since WWII

Relative levels of per capita income and labour productivity, Germany as % of U.S.



Source: The Conference Board, Total Economy Database



U.S. advantage in per capita income and productivity growth is not ubiquitous

Average Annual Growth Rates of Output, Income, Productivity and Hours Worked, 1995-2007.

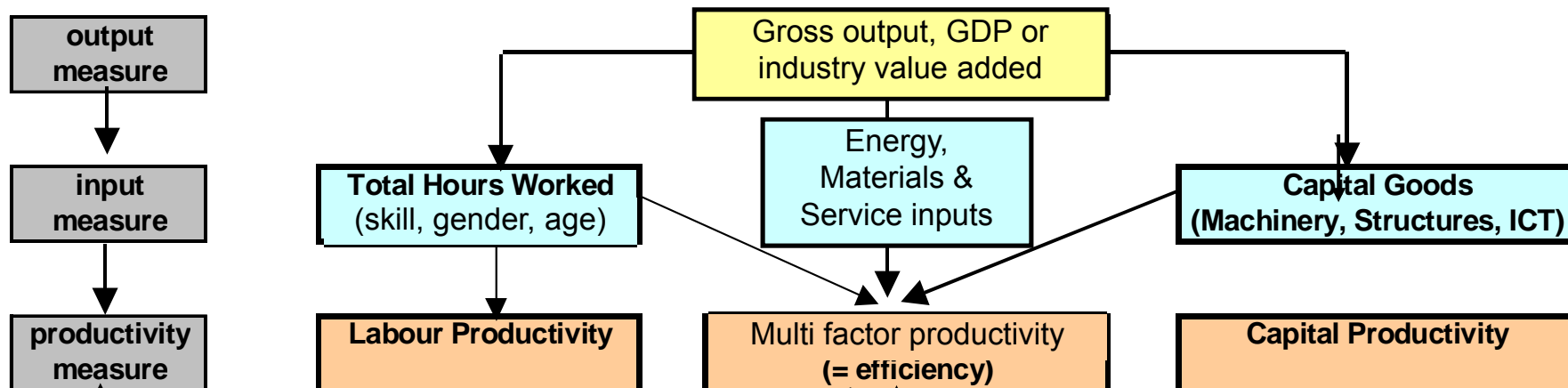
1995-2007 (%)	Gross domestic product	GDP per capita	GDP per person employed	GDP per hour worked	Total hours worked	Effect of population growth	Effect of Participation	Effect of Hours per person
Sweden	3.1	2.9	2.3	2.4	0.7	0.2	0.6	-0.1
United Kingdom	2.9	2.6	2.0	2.4	0.7	0.3	0.6	-0.4
Netherlands	2.8	2.2	1.2	1.6	1.3	0.6	1.0	-0.4
Denmark	2.2	1.8	1.4	0.9	1.3	0.4	0.4	0.5
France	2.2	1.7	1.2	1.7	0.6	0.5	0.5	-0.5
Germany	1.6	1.5	1.1	1.7	-0.1	0.1	0.4	-0.6
EU-15	2.4	2.0	1.2	1.5	0.9	0.4	0.8	-0.3
United States	3.0	2.0	1.7	1.9	1.1	1.0	0.3	-0.2

Source: The Conference Board, Total Economy Database



Different productivity concepts all have their own applications

Measures of Productivity, Input Variables and Sources of Growth

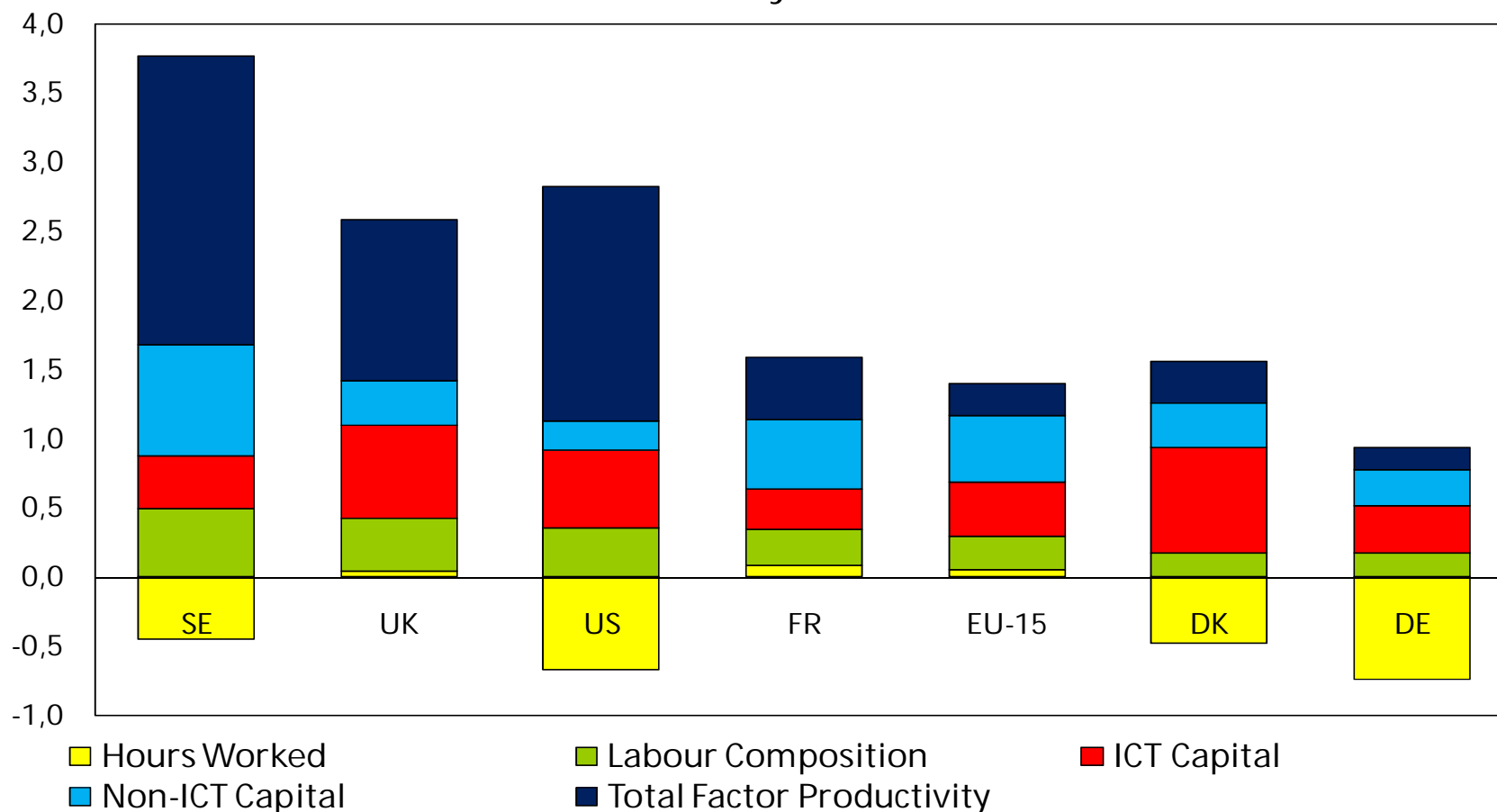


- Labor productivity is an easy measure to obtain; proxies contribution to living standards; provides link to wage setting process
- Capital productivity is related to efficiency of utilization of capital
- Total factor productivity is proxy for efficient use of all resources



MFP is the main source of differences in labor productivity growth between countries

Sources of Market Economy GDP Growth, 2000-2005

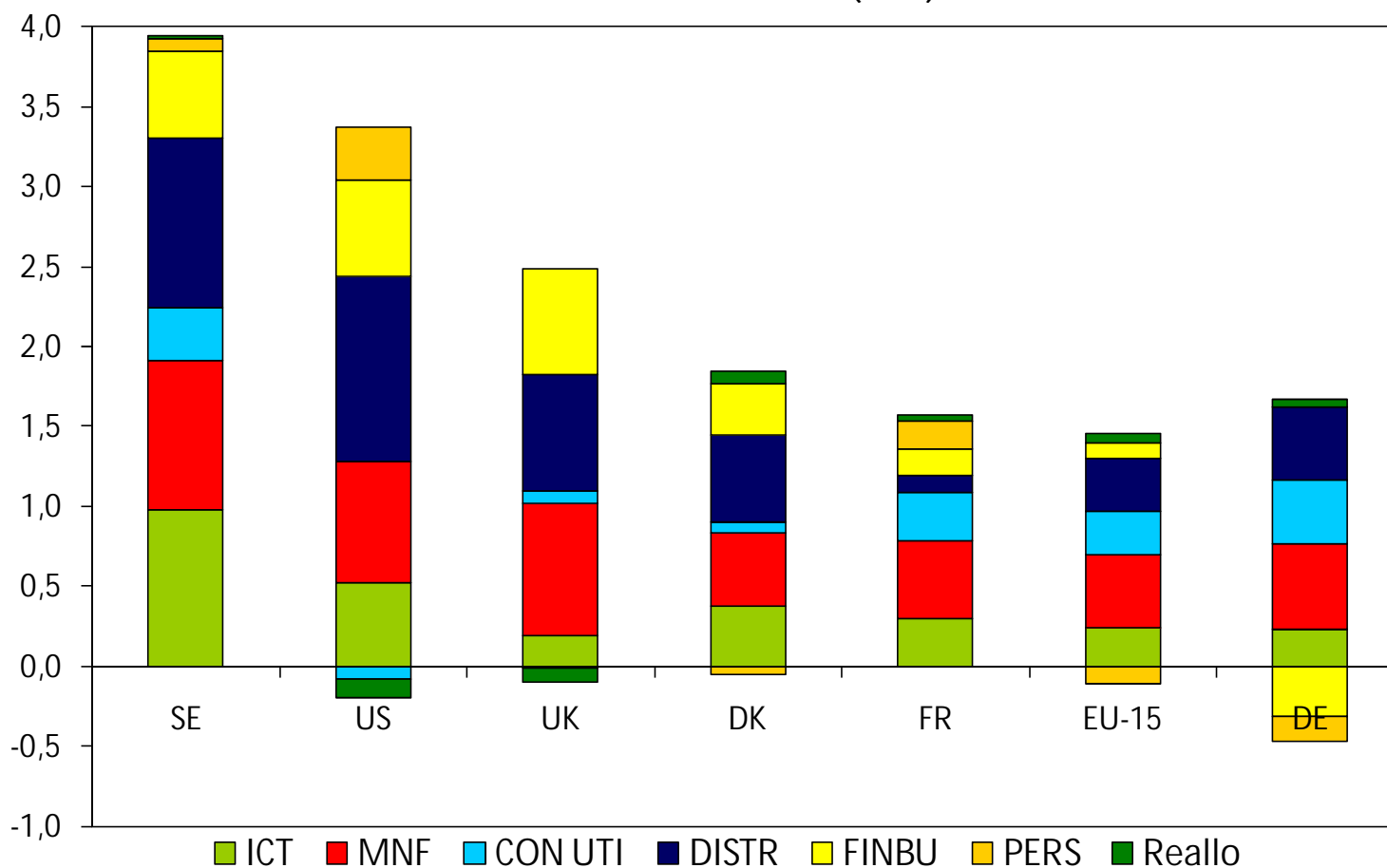


Source: EU KLEMS, The Conference Board



Weak productivity growth in services sector is key to Europe's underperformance

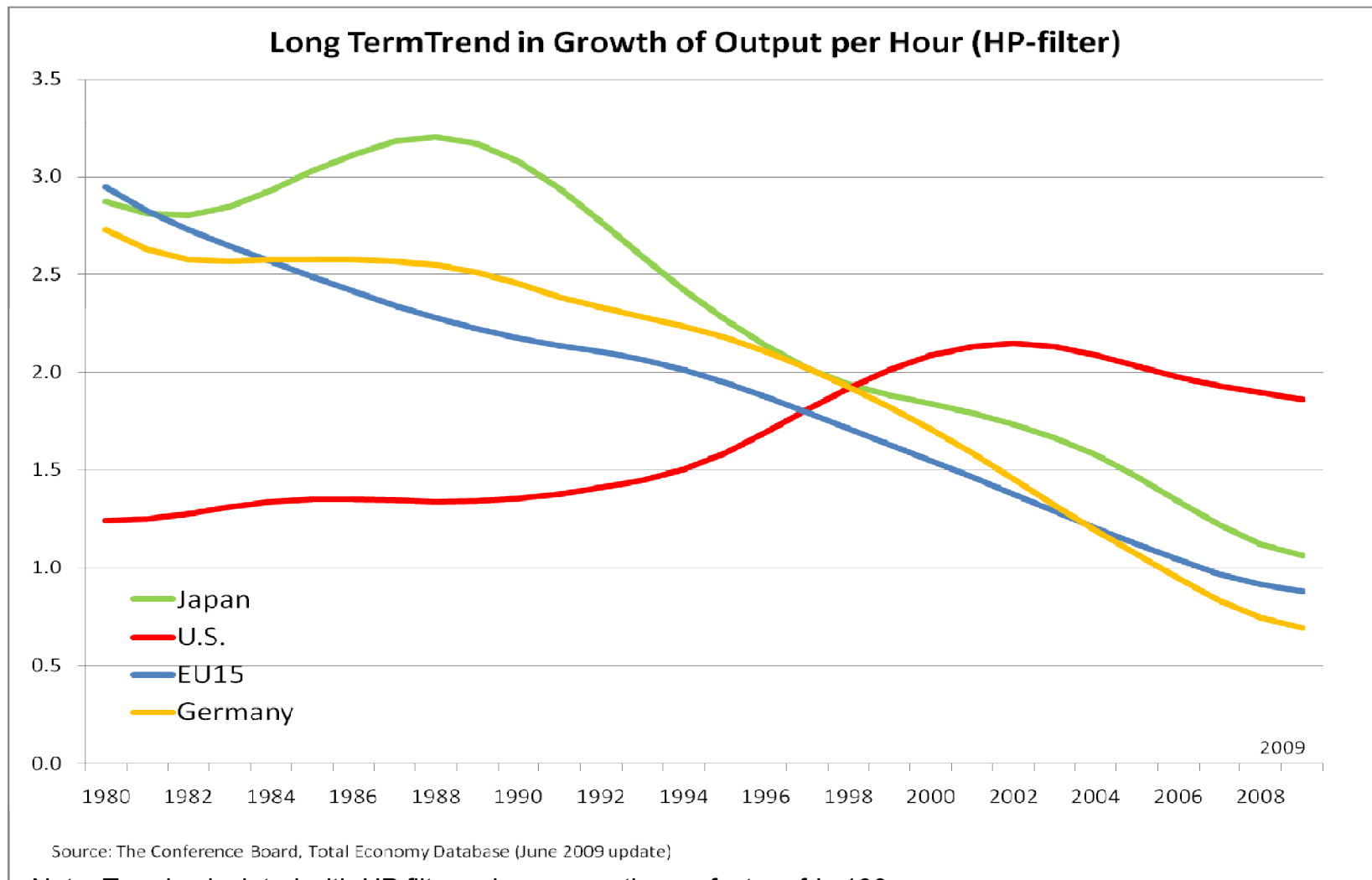
Contributions of Industries to Market Economy Labour Productivity
Growth 2000-2005 (in%)



Source: EU KLEMS, The Conference Board



The long term trend has been down since 2003

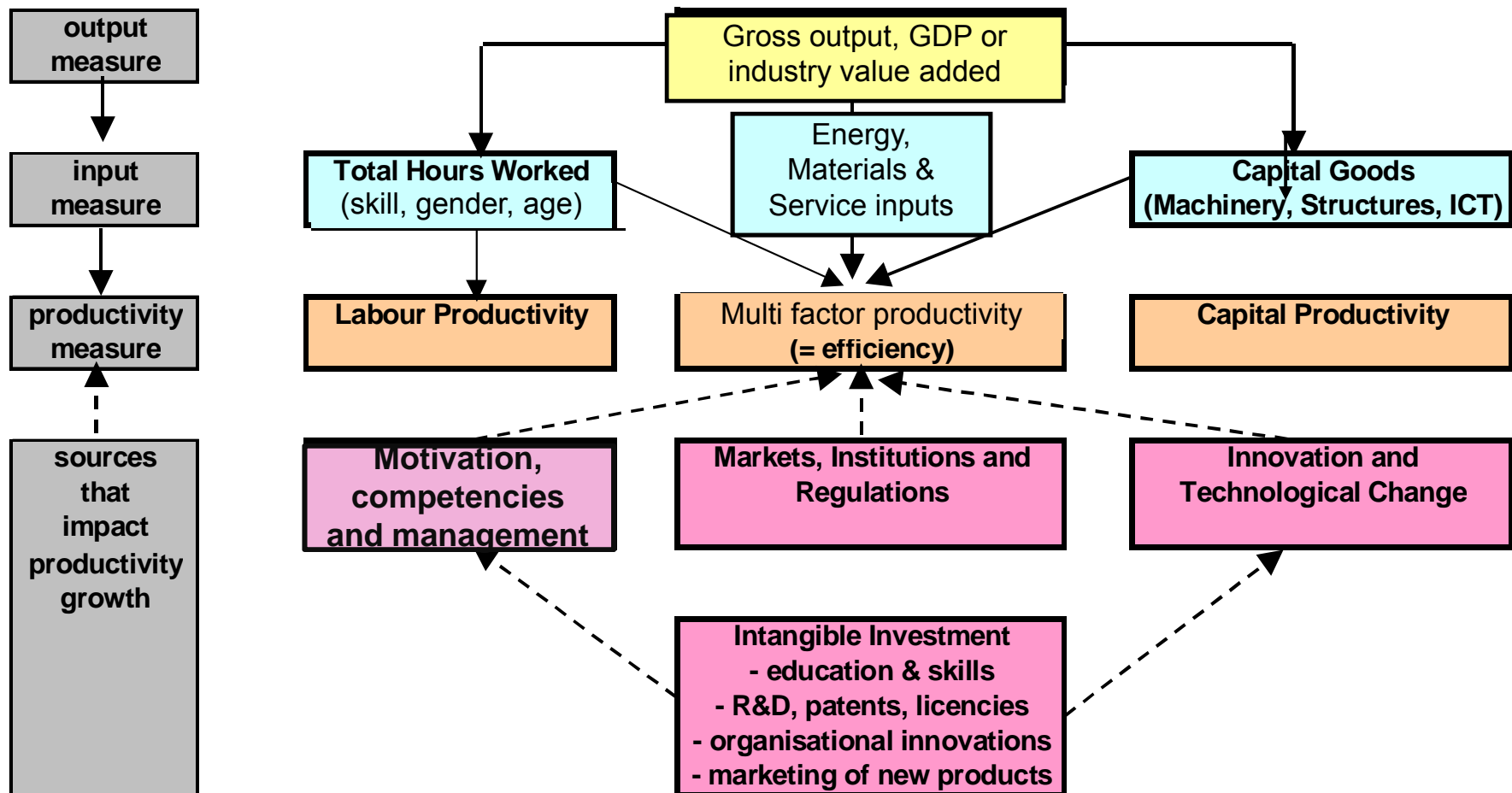


Note: Trend calculated with HP filter using a smoothness factor of $\lambda=100$.



How to fit in intangibles?

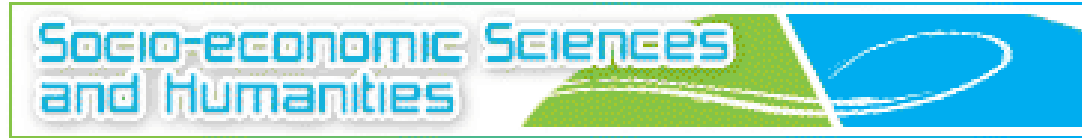
Measures of Productivity, Input Variables and Sources of Growth





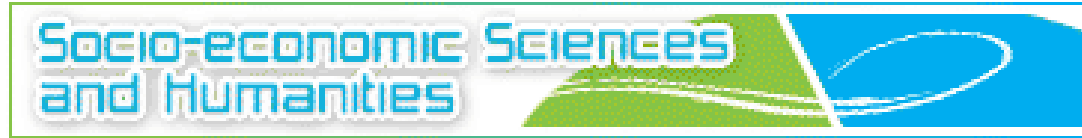
Different Approaches to Conceptualize Intangibles

- **Structural Characteristics** (Lev (2001), Fig. 1-2)
 - Innovation-related intangibles
 - Human resource intangibles
 - Organizational intangibles
- **Functional Characteristics – Value of Output**
 - Stock Market Value of Output (Hall, Prescott)
 - Projected Future Value of Output (FASB, BusinessWeek)
 - Securitization
 - Indicators and Indexes
- **Functional Characteristics – Value of Input**
 - Value Investments at Cost (Nakamura, CHS, BEA)
 - Tobin's "Q" hybrid cost-value link (HH, HHJ)



Change expensing of intangible inputs as a cost to accumulation as an asset

- Paraphrasing Solow: “Whilst the knowledge economy is all around us, it is still hard to see it in the official statistics”
- No clearcut distinction between tangibles and intangibles that justify a distinction between capitalizing and expensing
- “Any outlay than is intended to increase future rather than current consumption is treated as a capital investment”
- But strategic capital is different from hard capital
 - Intangibles are not a continuous input to current production
 - They are generally produced within the company, without a market transaction
 - They are largely invisible and are hard to count
 - They are largely non-rival and hard for the owner to appropriate full benefits.



Intangibles are a major source of strategic advantage to economy and individual firms = “Strategic Capital”

Name of Group	Type of Intangible/Strategic Capital
Computerized information	Software, computer programs and computerized databases
Scientific and Creative Property	Scientific R&D and non-scientific inventive and creative activities
Economic Competencies	Firm-specific human capital, organizational capital and brand names



A new cottage industry?

- The pioneers: US(Corrado, Hulten,Sichel), UK (Morrano, Haskel, Wallis) and Japan (Fukao, Miyagawa, Mukai, Shinoda, Tonoge) now in ROIW, September 2009
- Earlier followers: NL (van Rooyen, van den Bergen, Tanriseven), FI (Jalava, Aulin-Ahmavaara, Alanen), FR/DE/IT/ES (Hao, Manole, van Ark), SE (Edquist), CA (Baldwin, Gu, Lafrance, Macdonald), AUS, OECD
- New generation: FR (Delbeque et al.), DK/AU/GR/SO/CZ (Hao and van Ark), EU27 (INNODRIVE: Jona-Lasinio, Iommi. Roth), CO-INVEST, ...

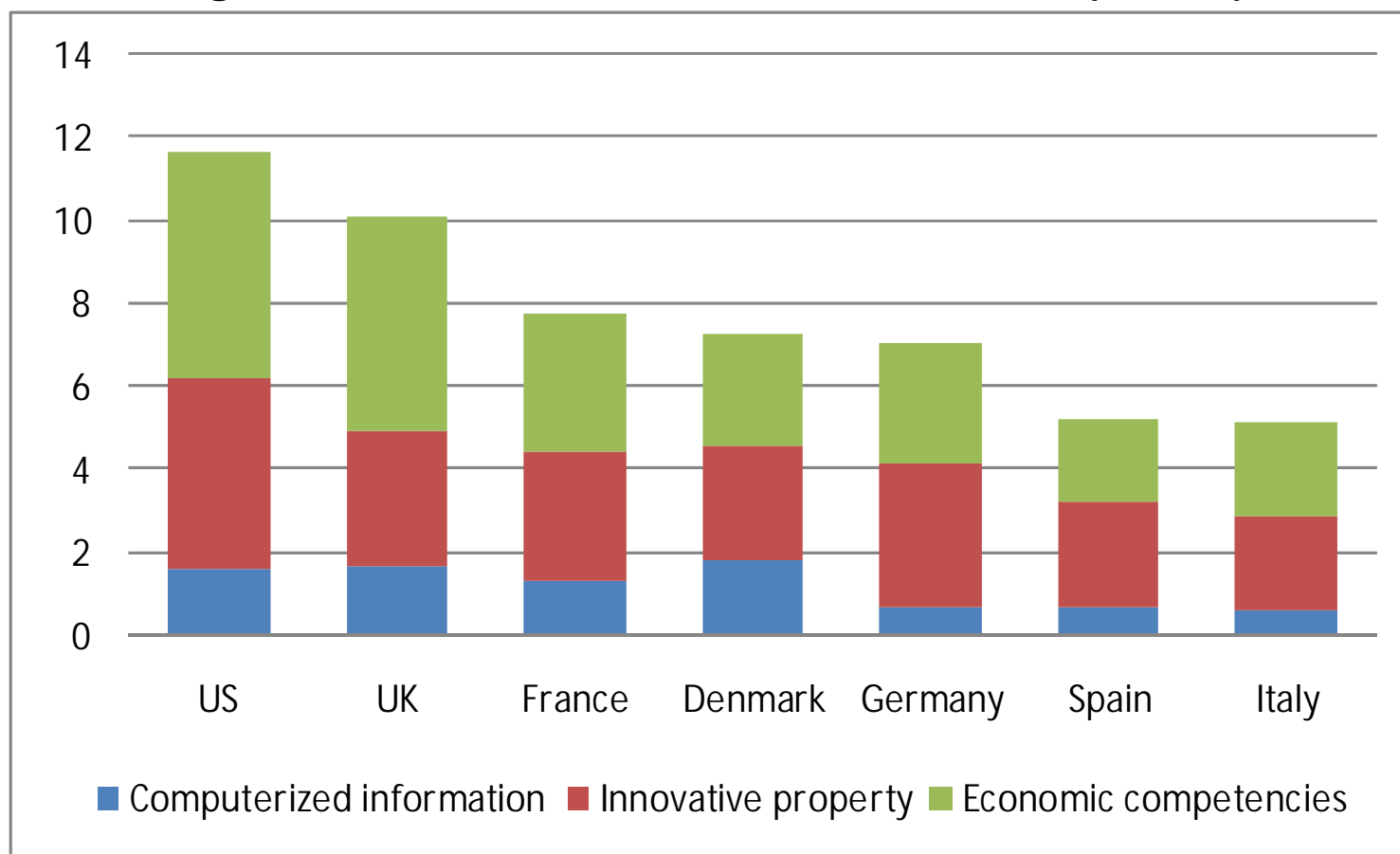
Spending on Intangible Assets in the Market Sector in Germany, France, Italy, Spain, UK and USA (% GDP)

Type of Expenditure	Germany 2004	France 2004	Italy 2004	Spain 2004	UK 2004	US 1998-2000
1. Computerized information	0.71	1.39	0.66	0.74	1.70	1.65
a) Software	0.69	1.35	0.66	0.72		
b) Databases	0.02	0.04	0.01	0.03		
2. Innovative property	3.47	3.12	2.26	2.51	3.23	4.57
a) R&D, including social sciences and humanities	1.69	1.32	0.52	0.55	1.09	2.06
b) Mineral exploration and evaluation	0.00	0.02	0.04	0.04	0.04	0.19
c) Copyright and license costs	0.20	0.32	0.10	0.19	0.21	0.81
d) Development costs in financial industry	0.70	0.58	0.79	0.35	0.69	0.79
e) New architectural and engineering designs	0.87	0.88	0.80	1.38	1.2	0.73
3. Economic competencies	3.27	3.92	2.67	2.19	5.95	6.91
a) Brand equity	0.84	1.51	1.19	0.58	1.59	2.53
Advertising expenditure	0.69	1.24	0.91	0.33	1.2	2.33
Market research	0.15	0.27	0.28	0.25	0.39	0.2
b) Firm-specific human capital	1.34	1.51	1.00	0.83	2.45	1.25
Continuing vocational training	0.67	1.25	0.69	0.73		
Apprentice training	0.67	0.26	0.31	0.11		
c) Organizational structure	1.09	0.91	0.48	0.78	1.92	3.13
Purchased	0.50	0.31	0.11	0.25	0.6	0.87
Own account	0.59	0.60	0.37	0.53	1.31	2.26
Total Spending	7.45	8.43	5.58	5.44	10.88	13.13
Total Investment	7.05	7.84	5.15	5.20	10.1	11.7



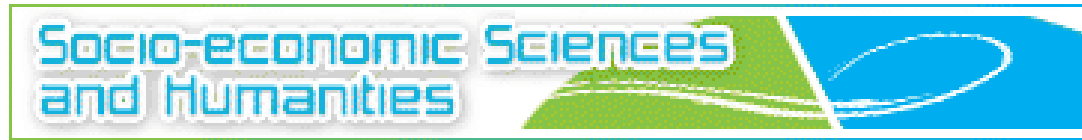
Investments in intangible capital are large relative to total GDP

Intangible Investment in the Market Sector in 2004 (% GDP)



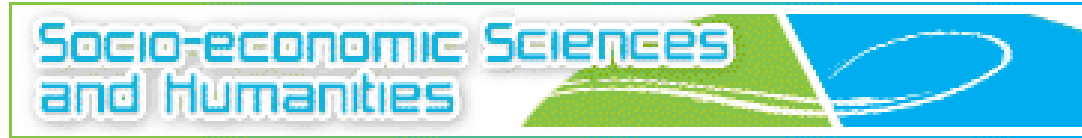
Source: The Conference Board.

Note: Values of the US are the annual averages of 2000-2003.



What is the boundary?

- CHS: ‘any use of resources that reduces current consumption in order to increase it in the future qualifies as investment’
 - Derived from capital theory
 - Very broad definition
- INNODRIVE – satisfies four properties
 - Asset identifiable (capable of being sold, licensed etc.)
 - Owner identifiable
 - Produces economic benefits for owner
 - Provides services for more than one year.
- INNODRIVE narrower definition (e.g. CO-INVEST+ include initial training of apprentices as well as continuous training)
- Some data sources are the same (e.g. computerised information from EU KLEMS, scientific R&D from Eurostat), but many sources are different
- Both CO-INVEST and INNODRIVE attempt to adjust for some double counting



CO-INVEST+ studies compared to INNODRIVE

New Intangibles, % of market GDP (2001-04)

Countries	Co-Invest and others	Innodrive	Difference
UK	8.8%	6.2%	2.6%
Finland (Jalava et al.)	7.1%	5.2%	1.9%
Italy	5.1%	3.4%	1.7%
Netherlands (van Rooijen et al.)	6.4%	4.8%	1.6%
Germany	6.0%	4.6%	1.4%
Czech Republic	5.8%	4.4%	1.4%
Spain	4.4%	3.0%	1.4%
Denmark	5.6%	4.4%	1.2%
France	6.3%	5.2%	1.1%
Austria	4.7%	4.4%	0.3%
Sweden	6.7%	6.7%	0.0%

Sources: CO-INVEST and INNODRIVE estimates; comparison by Mary O'Mahony



Canada paper: Use different list of Intangibles

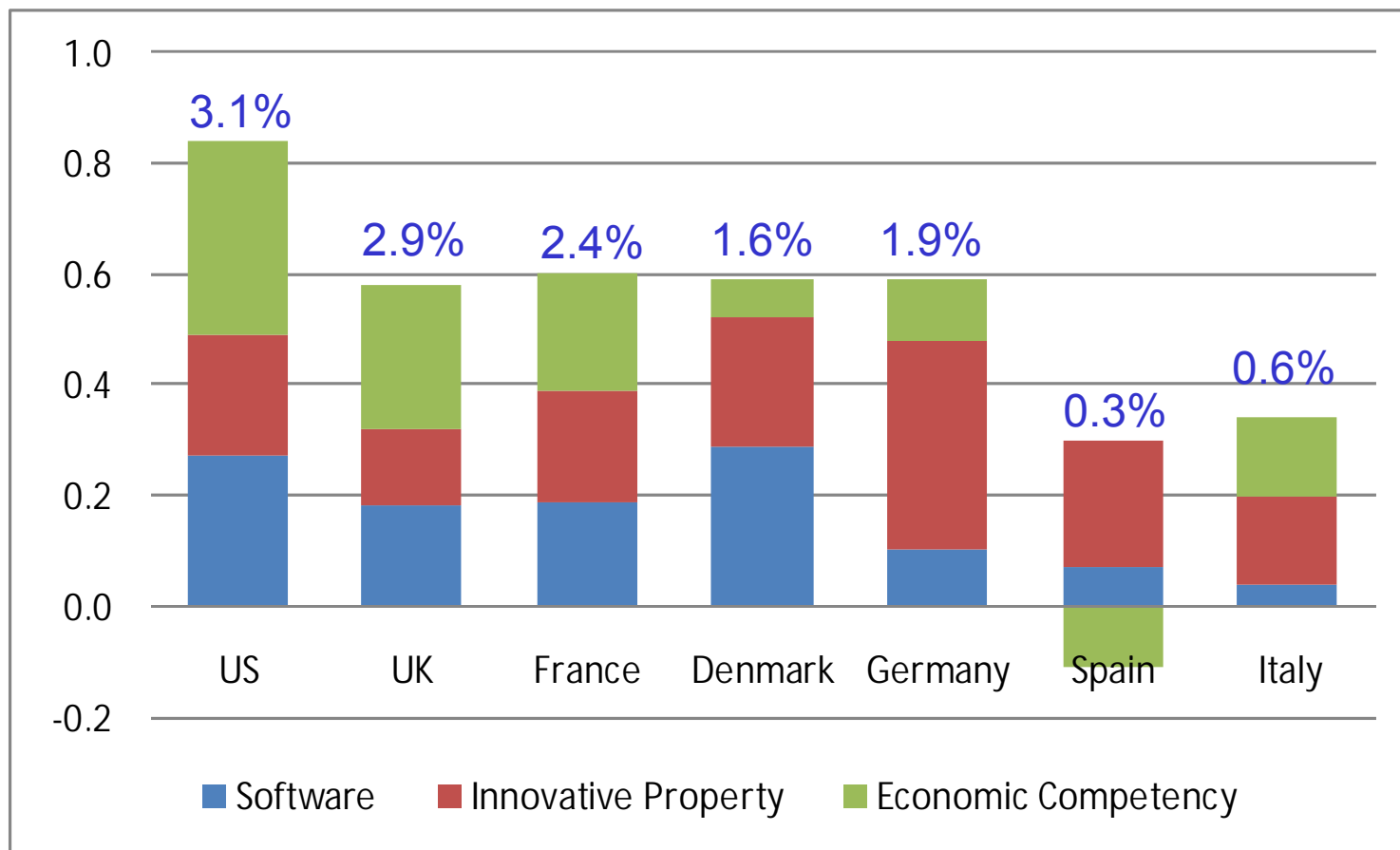
- Advertising– from IO tables
- Mineral Exploration – expenditures on exploration drilling etc.
- Science
 - Purchased Science and Engineering (**PSE**) – from IO tables (royalties, engineering services etc.)
 - R&D as traditionally defined - from surveys
 - Software
 - **Own Account Other Science (OAOS)** – measured by incomes earned by those in science and engineering occupations
- Do not include economic competencies as in CHS
 - Argue data not consistent with national accounts

Source: Baldwin et al. with thanks to Mary O'Mahony



Including intangibles in growth accounts

Contribution of Intangible Assets to Labor Productivity Growth in the Market Sector, 1995-2003



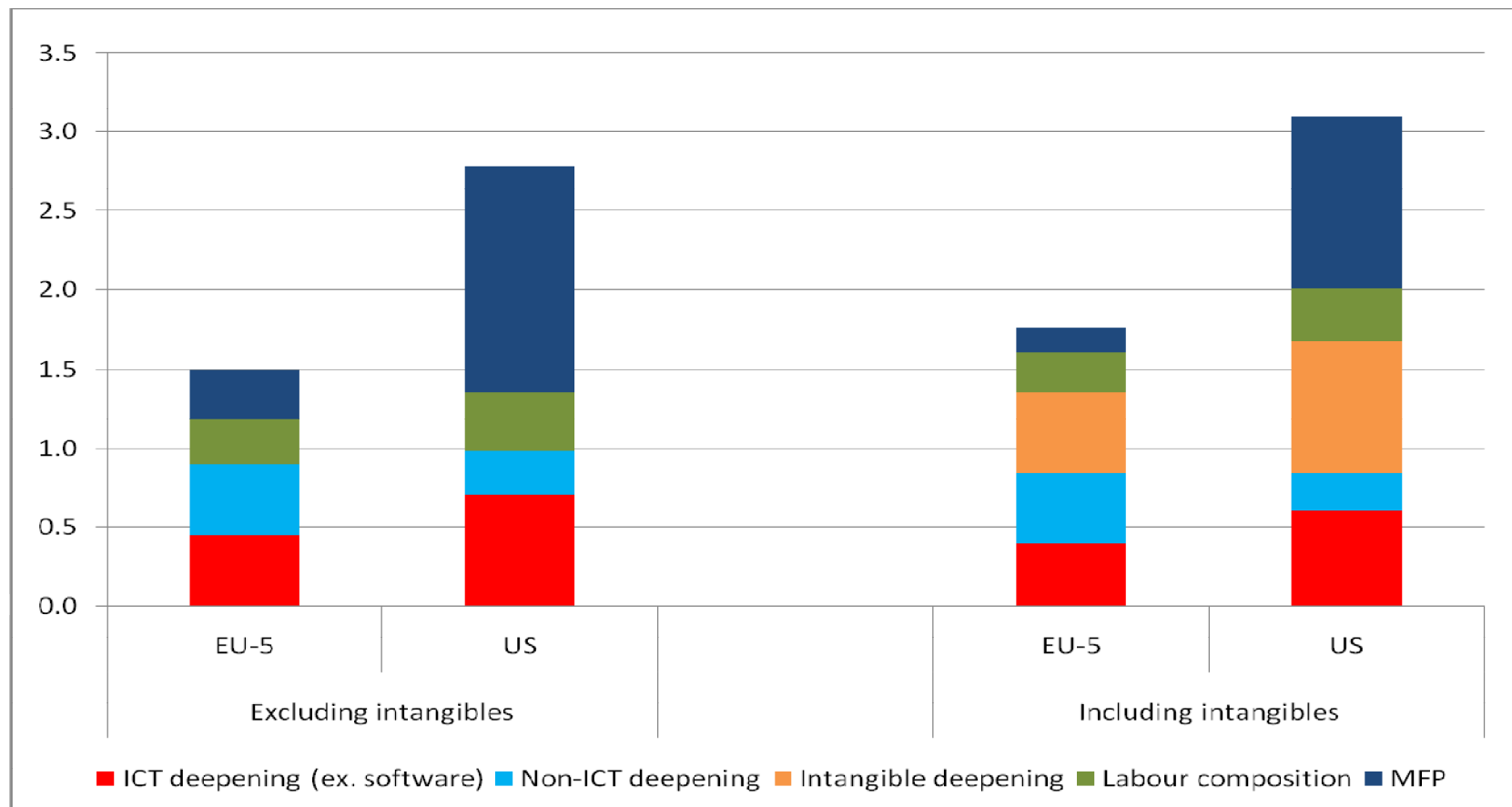
Source: The Conference Board.

* Percentages are the annual growth rates of labor productivity on average from 1995 to 2003.



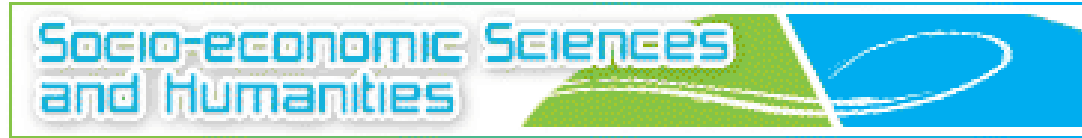
Does intangible capital explain of the labor productivity gap?

Sources of labour productivity growth with and without intangible capital, 1995-2003



Source: The Conference Board.

Note: EU-5 includes Germany, France, Italy, Spain and the United Kingdom



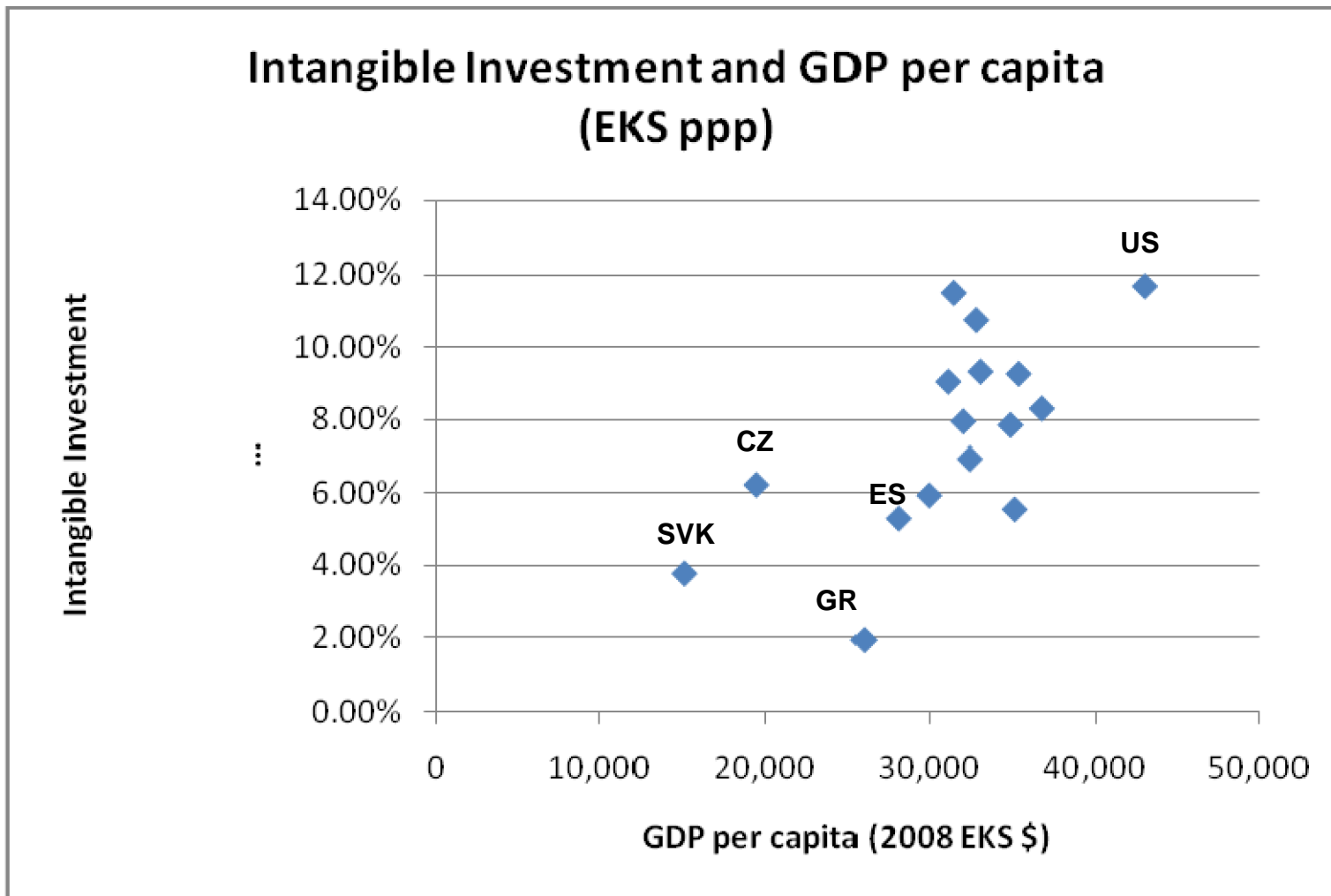
Parable on measurement from Zvi Griliches

“MY FATHER WOULD NEVER EAT CUTLETS IN A RESTAURANT BECAUSE HE DIDN’T KNOW WHAT WAS IN THEM. HE WOULD NEVER EAT CUTLETS AT HOME BECAUSE HE DID KNOW WHAT WAS IN THEM”

HOW DO YOU WANT YOUR S.O.G. ESTIMATES: WITH OR WITHOUT INTANGIBLES?



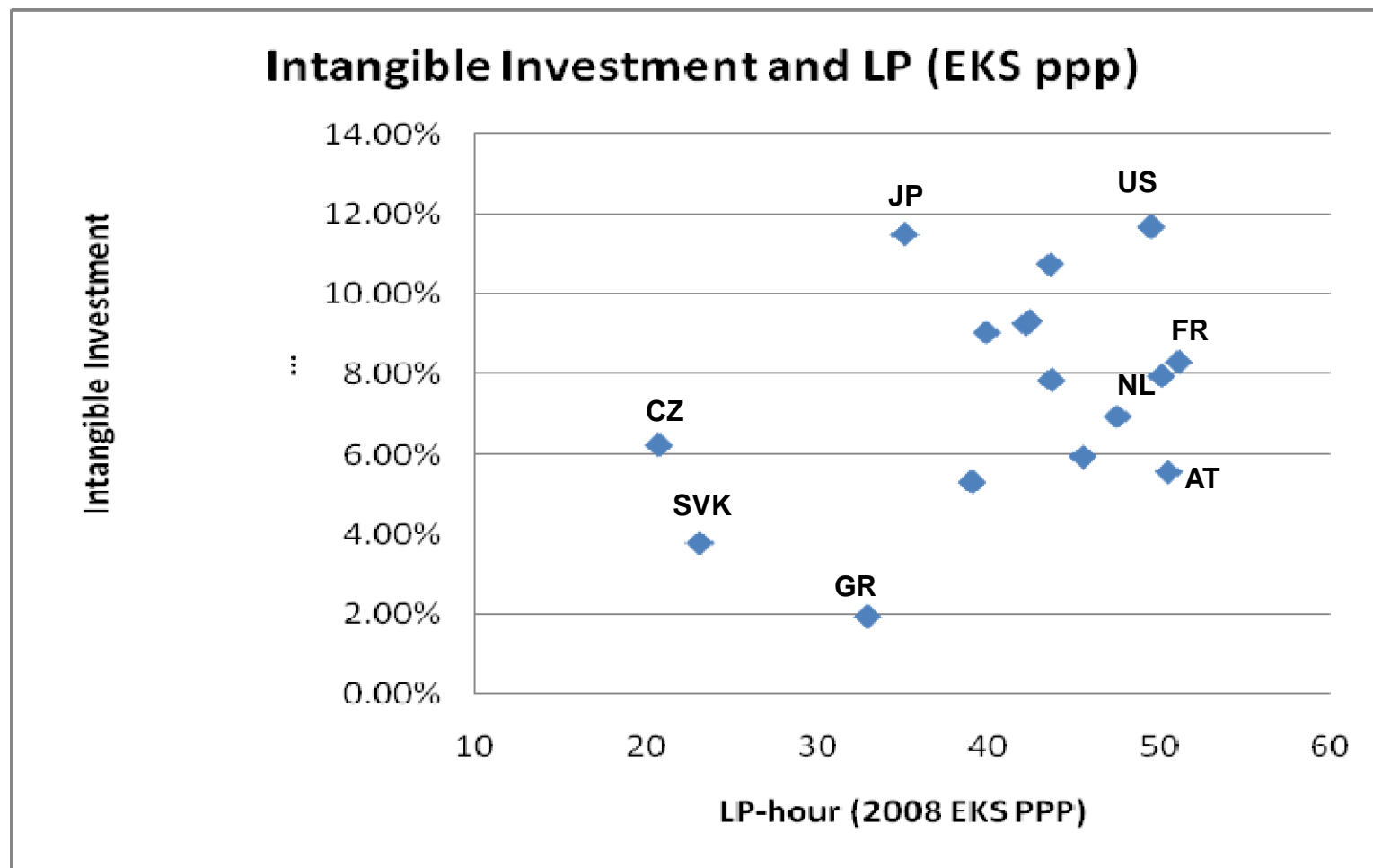
Relationship between intangible intensity and income?



Sources: CO-INVEST, The Conference Board



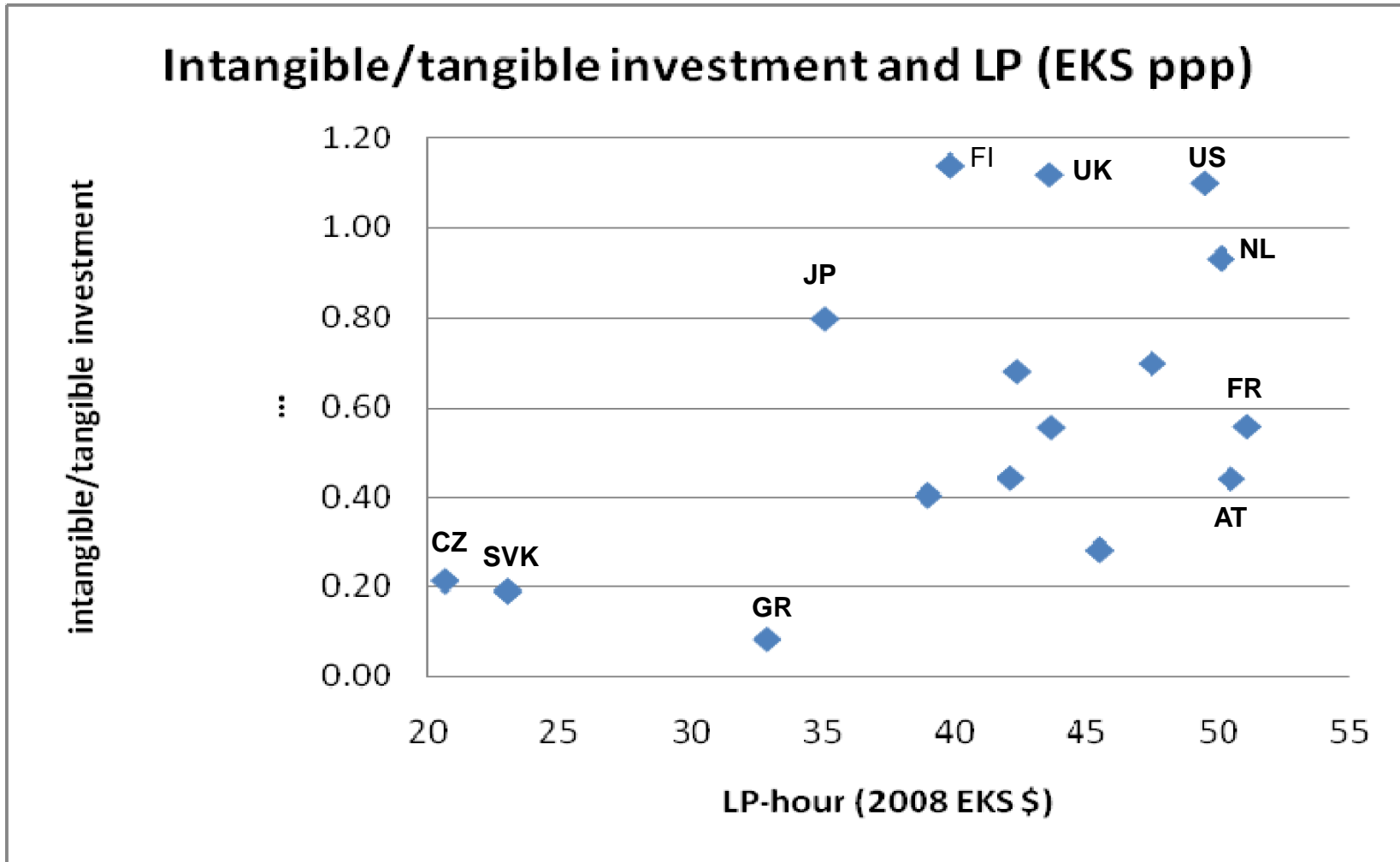
Less clear relative to labour productivity



Sources: CO-INVEST, The Conference Board



... or relative to intangible/tangible ratio



Sources: CO-INVEST, The Conference Board



The need for a micro foundation

- **CONVENTIONAL NEOCLASSICAL AGGREGATE S.O.G. BASED ON**
 - NEOCLASSICAL PRODUCTION FUNCTION
 - FOCUS ON PLANT AND EQUIPMENT, INCLUDING IT
 - PERFECT COMPETITION (EQUILIBRIUM)
 - CONSTANT RETURNS TO SCALE
 - MARGINAL OPTIMIZATION
 - PRESENT-VALUE/COST ARBITRAGE (WITH RISK)
- **COMPANY- LEVEL S.O.G. BASED ON**
 - FOCUS ON PRODUCT INNOVATION AND MARKETING
 - EXISTENTIAL ASSETS (INTANGIBLES)
 - SCHUMPETERIAN COMPETITION (DISEQUILIBRIUM WITH UNCERTAINTY)
 - PRODUCTION WITH KEY *EX ANTE* FIXED COSTS
 - NO PREDICTABLE (OR MARGINAL) LINK BETWEEN CURRENT INPUT AND FUTURE OUTPUT
 - UNCERTAIN RESIDUAL *EX POST* GAINS OR LOSSES



Implicit Model of the Firm

- 1. FIRM HAS PRODUCTION SEGMENTS (I) THAT GENERATE CASH REVENUES**
- 2. FIRM HAS OVERHEAD SEGMENTS (II) THAT ADMINISTER THE DAILY OPERATION OF THE FIRM**
- 3. FIRM HAS IN-HOUSE INVESTMENT GOOD-SEGMENTS (III) THAT MAKE FIRM-SPECIFIC CAPITAL TO GENERATE FUTURE INCOME**



Intangible Assets and the Puzzle

The Puzzle

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

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

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

Possible cause of the puzzle

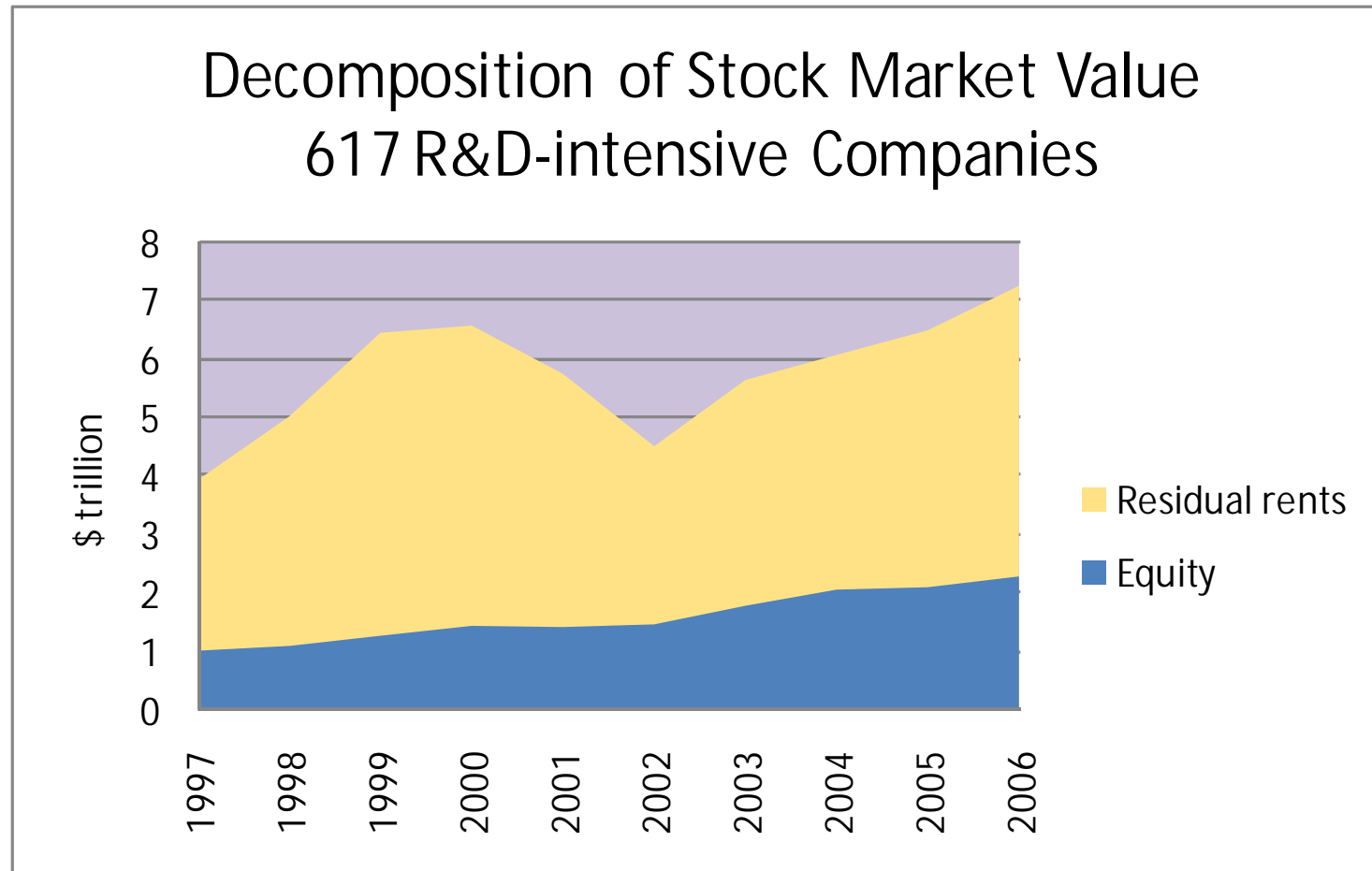
Accountants treat expenditure on intangibles produced within a firm as a current expense, not as an investment in the firm's future

Hulten and Hao (2008) estimate the stock of intangible assets for 617 R&D intensive firms in the U.S.

- Construct estimates of the cost-in-house investment in R&D and organizational capital
- Include “own” intangibles on corporate financial statements
- Amortization of R&D and organizational capital



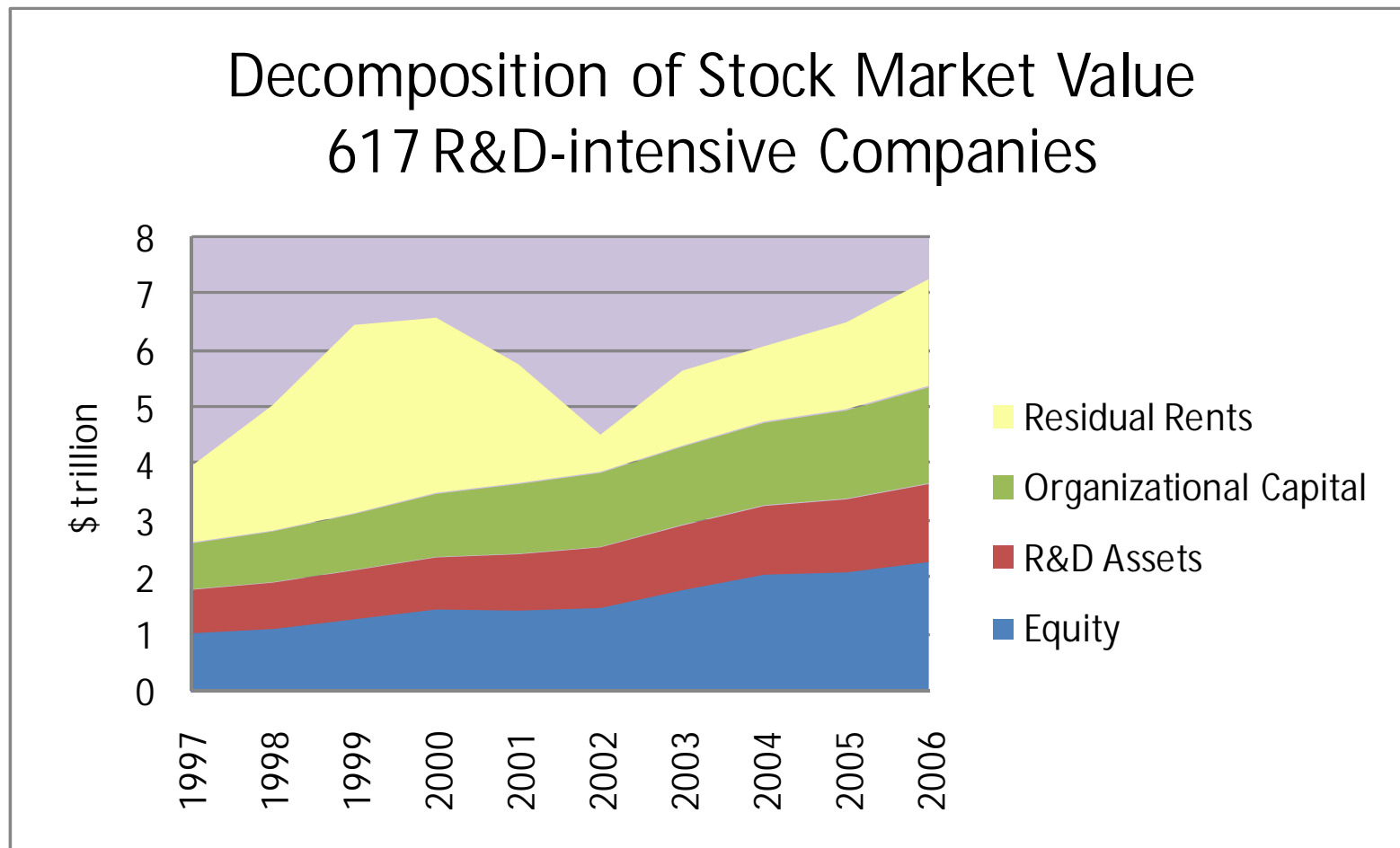
So where is the intangible capital within the firm?



Source: Hulten and Hao (2008).



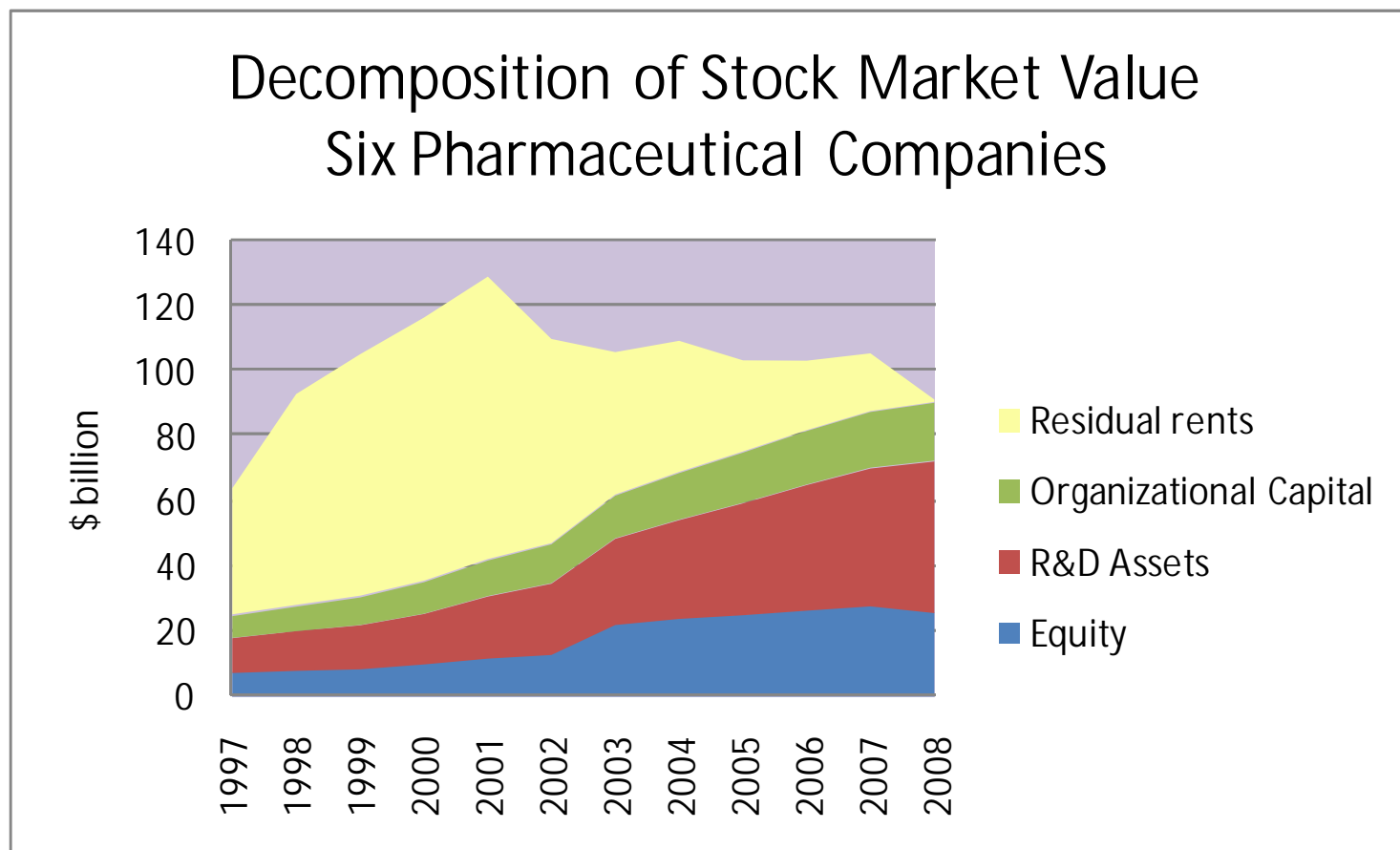
Intangible capital can explain a lot of the market value gap



Source: Hulten and Hao (2008)



... and recently even all of the market value in pharma



Source: The Conference Board

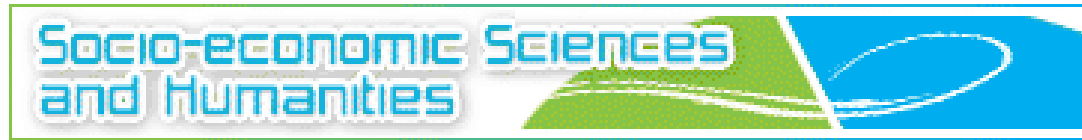
Note: The six companies are Abbott Laboratories, the Bristol-Myers Squibb Company, Eli Lilly and Company, Johnson and Johnson, Pfizer Inc., and Wyeth.



Key Results – all sample companies, 2008

2008	US	Ger
%MV explained w/o Intan	0.30	0.48
%MV explained w Intan	0.77	1.10
ROE w/o Intan	0.33	0.11
ROE w/ Intan	0.17	0.05
Debt/EQ w/o Intan	2.15	2.62
Debt/EQ w/ Intan	0.83	1.15
R&D spending/conventional revenues	0.08	0.09
(R&D & org. assets)/total conventional assets	0.60	0.35

Note: The US sample includes 633 R&D intensive firms. The Germany sample includes Adidas, Audi, BASF, Bayer, BMW, Daimler, Merck, SAP, Siemens, Stada and Volkswagen.



Comparing 11 German to US firm level study

- Findings:
 - German companies have larger fraction of market capitalization explained by conventional equity, both before and after own-intangibles are counted
 - Have lower return on equity, before and after own-intangibles
 - Have higher debt-equity ratios
 - And are comparably R&D intensive but less own-intangibles-intensive
- Caveats:
 - The German sample is much smaller, thus more prone to idiosyncratic variation (it is more heavily weighted to the auto industry)
 - While broadly similar, significant differences in intangibles accounting between US GAAP and IFRS
 - Differences in corporate structure & governance may matter, so accounting differences may not reflect underlying structural differences
 - Mergers, acquisitions, and spinoffs over time may bias the estimation of capital stocks in particular for German firms in our sample (e.g., Siemens)
 - To delve further, we look at metrics for the macro German business sector, and then at direct comparison of similar firms



Comparison of US GAAP and IFRS Treatment of *Intangible Assets* - Significant Differences

IFRS	US GAAP
<ul style="list-style-type: none"> •Expenditure on relocation or reorganisation is expensed as incurred. 	<ul style="list-style-type: none"> • Certain relocation costs following a business combination are capitalised. Other relocation or reorganisation expenditures are expensed as incurred, like IFRS.
<ul style="list-style-type: none"> •Intangible assets may be revalued to fair value only if there is an active market. 	<ul style="list-style-type: none"> • Intangible assets cannot be revalued.
<ul style="list-style-type: none"> •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. 	<ul style="list-style-type: none"> • 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 IFRS.
<ul style="list-style-type: none"> •Advertising and promotional expenditure is expensed as incurred. 	<ul style="list-style-type: none"> •Direct-response advertising expenditure is capitalised if specific criteria are met. Other advertising and promotional expenditure is expensed as incurred, like 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



Final remarks

- Constructing estimates of intangible investments and capital are important in understanding sources of growth
- Intangibles represent a higher share of US GDP than European countries, and impact higher on TFP growth in US
- But we cannot explain the transatlantic divide of divergence in TFP growth by this 'missing intangible input' alone
- To the extent that innovation is more formal, or largely paid for by companies, more may be picked up through intangibles
- Next steps
 - Room for narrowing differences between various approaches to measure intangibles (boundary, depreciation functions, prices)
 - Industry level estimates of intangibles, including extension to non-market sectors
 - A micro foundation for intangibles is needed to allow incorporation of Schumpeterian aspects in growth accounting framework
 - Innovation does not only come through investment in intangibles, but also through public investment, institutional innovation and path dependency