

Measuring intangibles of enterprises: The case of Finland and the UK

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22-23 February, 2011

INNODRIVE final conference, Brussels



UNIVERSITY of VAASA

The research was undertaken as part of the INNODRIVE project financed by the EU 7th Framework Programme, grant agreement no. 214576.

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Overview

- INNODRIVE methodology for measuring firms' intangible assets
 - Görzig, Piekkola and Riley (2011)
- Intangibles in UK firms
 - Riley and Robinson (2011)
- Intangibles in Finnish firms
 - Piekkola (2011)

Measuring firms' intangibles

Accounting for intangibles

ESA95 Value Added =

- Sales less intermediate consumption
- Inventory changes
- Own account production of assets

Accounting for intangible assets

- Reduces measured intermediate consumption
- Increases measured own-account production of assets

Outline of approach

- Assess labour costs associated with intangible production
 - Evaluate occupational structure of the firm's workforce using linked employer-employee data
- Account for related costs of intangible production
 - Evaluate cost structure of production in R&D, Computer and Other business service industries
- Additional assumptions
 - About the share of worker effort that leads to investment
 - Capitalisation (depreciation rates, starting stocks)

Investment in intangibles

=

(cost of workers performing “intangible” tasks)

x

(share of worker effort leading to investment)

x

(cost of associated
physical capital & intermediates)

Workers involved in the production of intangibles

- Research & Development
 - Physicists, mathematicians, life science professionals
 - Architects, engineers
 - Health professionals
- Information and Communications Technology
 - Computing professionals & associate professionals
 - Computing services department managers
- Organisational capital
 - Production & operations department managers
 - Highly skilled business professionals
 - Sales, marketing, advertising & public relations managers, highly skilled artistic workers

Assumptions

	ICT	R&D	OC
Investment share of labor h_{IC}	0.5	0.7	0.2
Factor multiplier m_{IC}	1.48	1.55	1.76
Combined multiplier $M_{IC} = h_{IC} \cdot m_{IC}$	0.7	1.1	0.35
Depreciation rate	0.33	0.20	0.25

Two approaches to measuring organisational investment

- Expenditure-based approach
 - Investment is proportional to *labour costs*
- Performance-based approach
 - Investment is proportional to *labour productivity*
 - We also assess the proportionality factor

Performance-based approach

- What if the wages of organisational workers don't reflect their marginal products?
 - Complementarities with unobserved inputs
 - Rent-sharing
 - Organisational output is difficult to observe
- Assess productivity of organisational workers
 - Hellerstein, Neumark & Troske (JoLE, 1999)
- Within an endogenous growth framework
 - Mankiw, Romer, Weil (QJE, 1992)

Intangibles in UK firms

Intangibles in UK firms

- Data sources
 - Annual Business Inquiry (census of large firms, sample of smaller firms)
 - Annual Survey of Hours and Earnings (1% sample of employees)
- Coverage
 - Non-farm business sector excl. Finance, Construction, Utilities (accounting for 55% of whole economy GVA)
 - Sample includes approx 11,000 enterprises every year 1998-2006, covering a third of GVA in included industries
- Change in occupational classification (SOC90 and SOC2000)
 - Affects managerial occupations in particular
 - Data not strictly comparable before/from 2002
- LEED data
 - Firm linked data yields much smaller sample
 - Link by NACE3 & 3 size categories (270 linking cells)

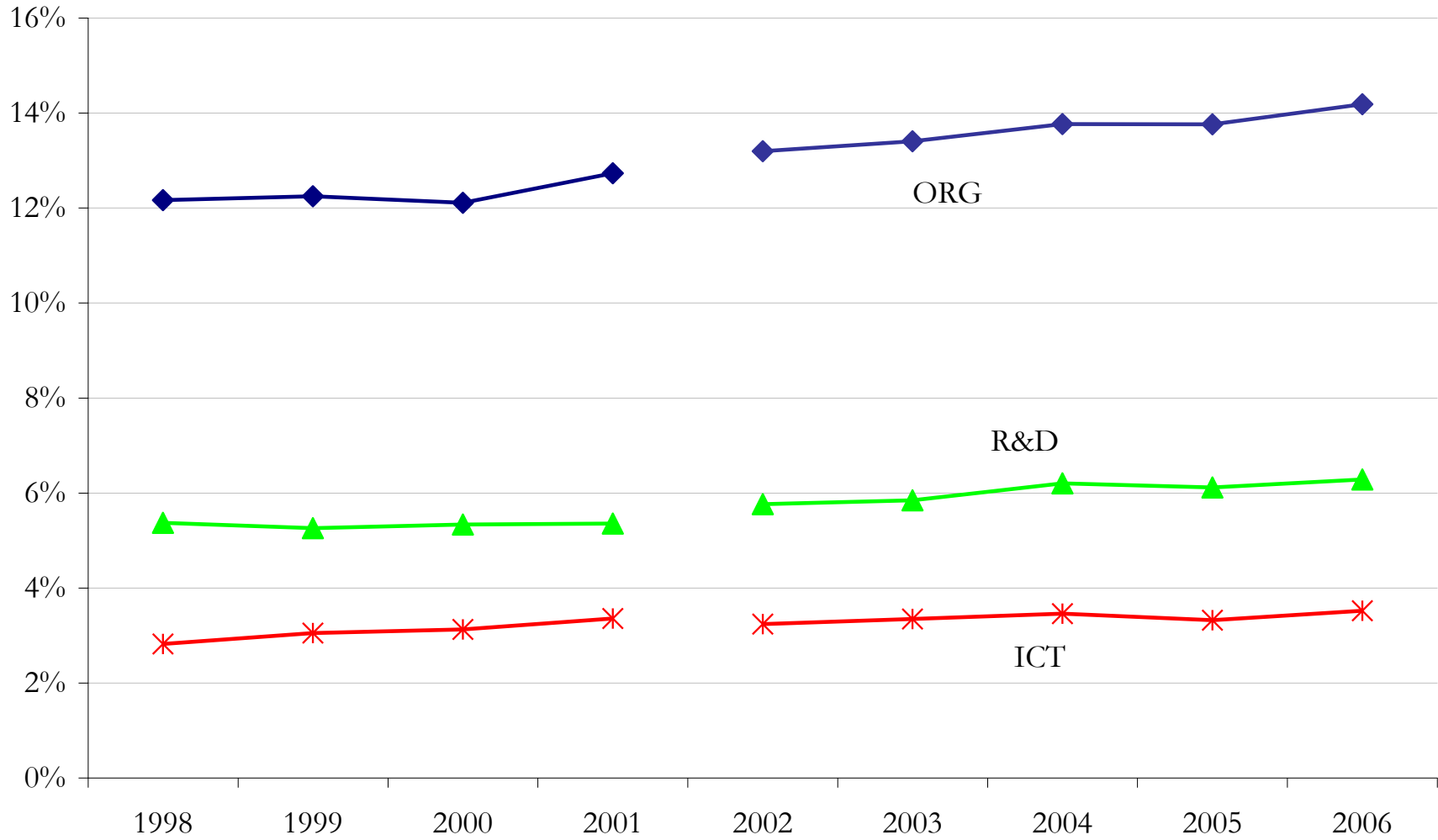
Firm versus industry-size linked occupational measures

Correlation of occupational distribution of the firm derived from 1% sample of employees and derived for the industry/size group

	Share of employees	Share of hours	Share of labour costs
Organisation	0.524	0.529	0.504
R&D	0.762	0.760	0.735
ICT	0.803	0.803	0.734

Notes: Correlations across 3633 firm-year observations; All statistically significant at the 1% level

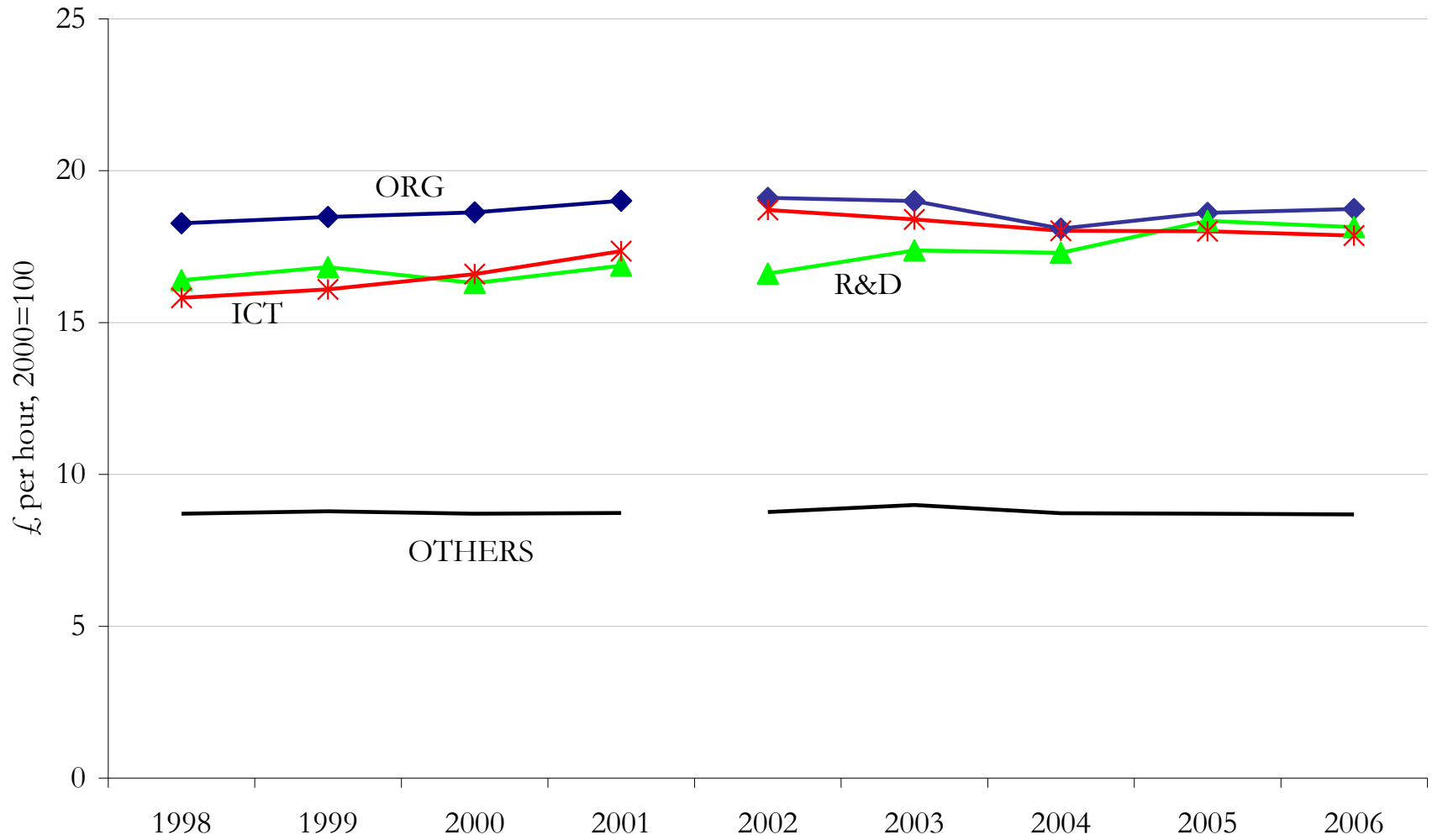
Employment shares by occupation group



Notes: Non-Farm private business sector excl. CA, E, F, J

Source: Annual Survey of Hours and Earnings, Labour Force Survey

Hourly labour costs by occupation group



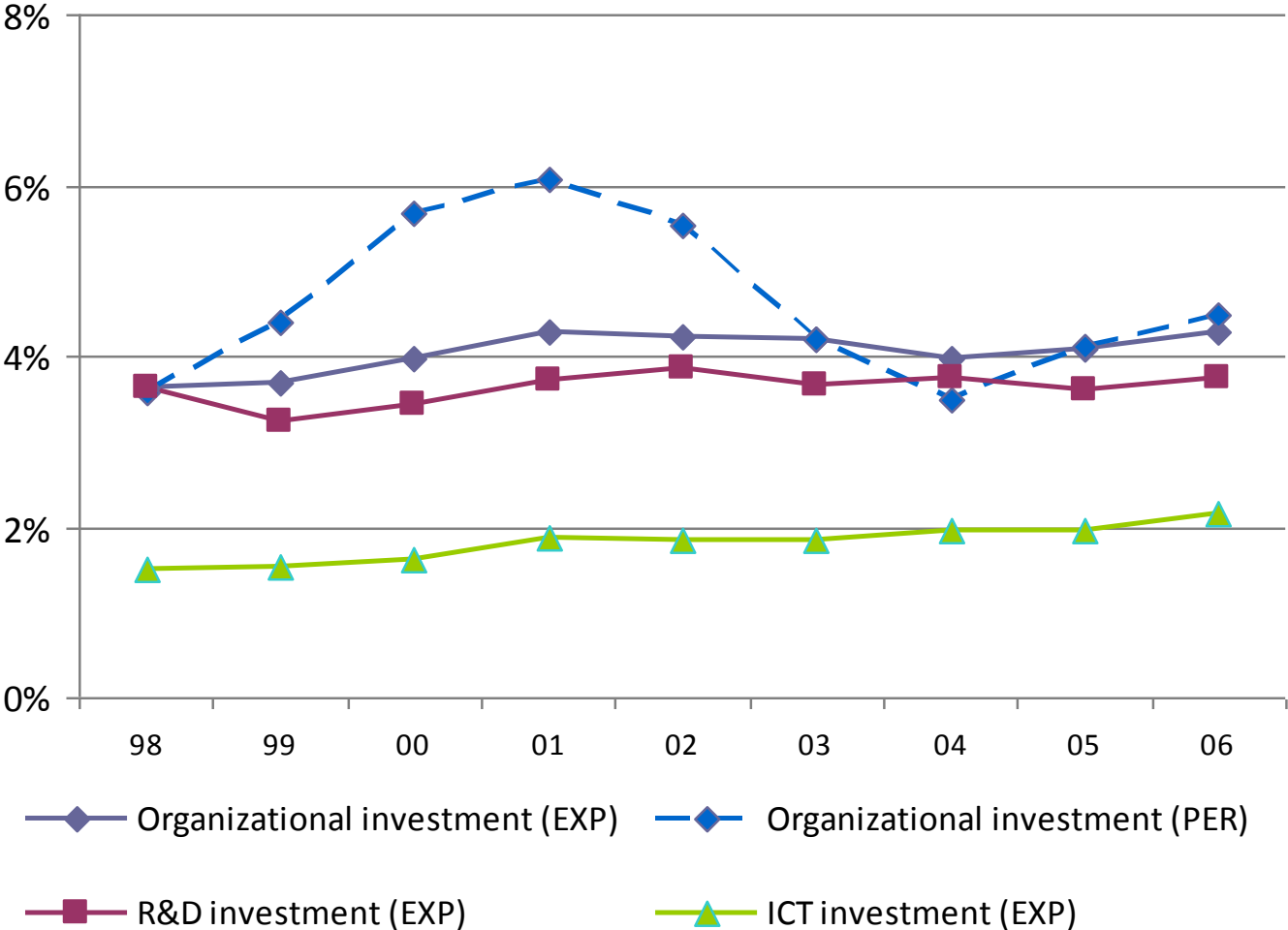
Notes: Non-Farm private business sector excl. CA, E, F, J; Deflated by average earnings index (2000=100).
Source: Annual Survey of Hours and Earnings, Labour Force Survey

Relative marginal products and wages OC workers versus non-OC workers (1998-2006)

- Positive productivity-wage gap in the Manufacturing & Business Service Sectors

Industry	Firms		L	IT	R&D	OC	K	OC workers versus non-OC workers	
								Estimated Ratio of Marginal Products	Ratio of Hourly Wages
Manufacturing	35,889	coeff	0.599	0.053	0.135	0.133	0.086	3.05	2.05
		t-stat	(16.7)	(15.7)	(28.6)	(4.4)	(28.5)	(16.8)	
		weighted coeff	0.580	0.053	0.136	0.149	0.085	3.09	
Business Service Sector (Finance not included)	24,897	coeff	0.449	0.199	0.155	0.111	0.088	4.16	2.00
		t-stat	(20.0)	(18.0)	(23.2)	(5.4)	(11.9)	(13.8)	
		weighted coeff	0.444	0.199	0.153	0.112	0.084	3.99	
Trade and Consumer Services	24,896	coeff	0.592	0.138	0.139	0.053	0.039	-0.31	2.03
		t-stat	(44.3)	(12.5)	(31.2)	(2.7)	(6.6)	(0.3)	
		weighted coeff	0.589	0.140	0.139	0.055	0.036	0.50	
Other (Construction, Hotels, Utilities)	13,106	coeff	0.606	0.110	0.067	0.128	0.093	2.25	1.93
		t-stat	(34.2)	(23.6)	(21.3)	(12.1)	(6.5)	(7.0)	
		weighted coeff	0.607	0.109	0.067	0.128	0.077	2.15	

UK Intangible investment to adjusted GVA



Correlations of capital items across firm-year observations

- Tangible and intangible capital positively correlated
- The three components of intangible capital are positively correlated (particularly ICT and organization capital)

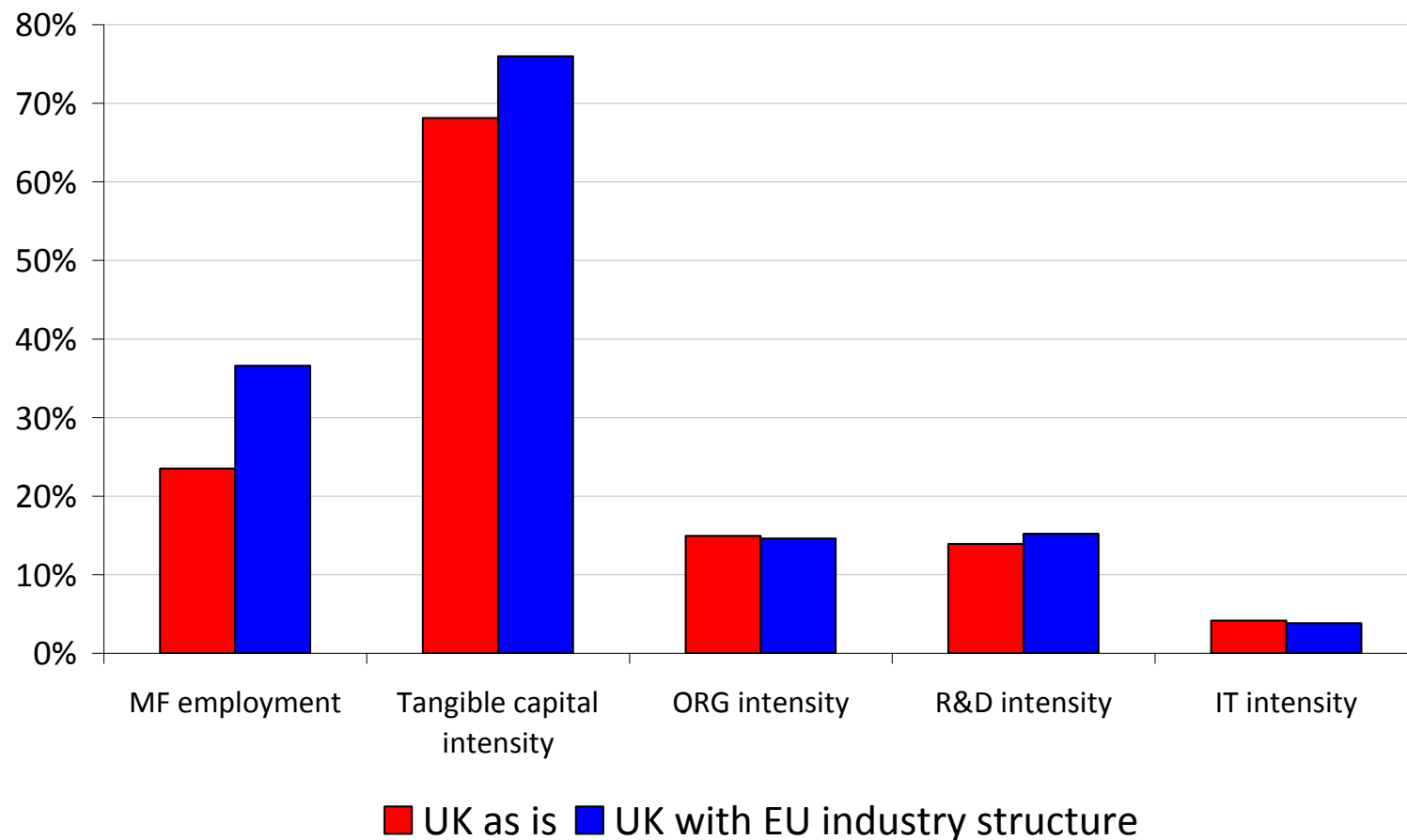
	OC PERF	OC EXP	R&D	ICT
OC EXP	0.90	1.00		
R&D	0.37	0.28	1.00	
ICT	0.47	0.43	0.23	1.00
K	0.20	0.18	0.12	0.15

Notes: 98788 observations; All variables measured relative to sales; All statistically significant at the 1% level.

What if the UK was Europe?

- More workers would be employed in manufacturing, fewer in services
- Production would involve more tangible capital (plant, machinery & equipment)
- Total intangible capital would not be hugely different (2% increase), but the composition would change
 - 2% less ORG capital and 9% less IT capital
 - 9% more R&D capital

What if the UK was Europe?



Notes: Figures calculated for the non-farm business sector excl. agriculture, finance, utilities and construction; Capital intensities refer to capital intensity of GVA; Tangible capital includes plant, machinery and equipment capital.

Growth Accounting 1998-2006

- Intangibles contribute approx 0.4% to annual GVA growth
- Reduce contribution of MFP

Year	Labour productivity	MFP	Tangible capital	Organization capital	R&D capital	ICT capital	Total Intangibles
Traditional							
Average 1999-2001	2.9 %	2.1 %	0.8 %	0.0 %	0.0 %	0.0 %	0.0 %
Average 2003-2006	4.2 %	2.4 %	1.8 %	0.0 %	0.0 %	0.0 %	0.0 %
Average all years	3.6 %	2.3 %	1.4 %	0.0 %	0.0 %	0.0 %	0.0 %
Incl Intangibles (EXP)							
Average 1999-2001	2.9 %	1.7 %	0.8 %	0.2 %	0.2 %	0.1 %	0.5 %
Average 2003-2006	4.0 %	2.0 %	1.6 %	0.1 %	0.1 %	0.1 %	0.4 %
Average all years	3.5 %	1.9 %	1.2 %	0.1 %	0.1 %	0.1 %	0.4 %
Incl Intangibles (PERF)							
Average 1999-2001	3.5 %	1.9 %	0.8 %	0.5 %	0.2 %	0.1 %	0.8 %
Average 2003-2006	3.7 %	2.0 %	1.6 %	-0.1 %	0.1 %	0.1 %	0.1 %
Average all years	3.6 %	2.0 %	1.2 %	0.2 %	0.1 %	0.1 %	0.4 %

Intangible capital in UK businesses

- Own-account intangible investment raises measured output of firms by approx 10% (weighted aggregate)
- Manufacturing firms are relatively R&D intensive, where service sector firms are relatively ICT and ORG intensive
- Investment in ICT accounts for 20% of intangible investment (smallest of the 3 components)
- R&D, ICT and ORG capital are positively correlated across firms
- Allowing for the productivity-wage gap of organisational workers
 - Organisational capital increases by 15-60% (in comparison to the expenditure based measure)
 - The time profile of intangible investment changes
- The rate of increase in intangible capital has declined between 1999-2001 and 2003-2006
- Intangible capital (own account) measures a little less than half of plant, machinery & equipment capital