

APPENDIX

Are Intangibles Running out of Steam?

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Appendix Table 1 – Investment/Value Added Shares, Real Investment Growth and Capital Stock Growth, Tangible and Intangibles, Market Economy, 1996-2007 and 2011-2019

	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007
	Investment/value Added share (%)				Real Investment (average annual % growth)				Real Capital Stocks (average annual % growth)			
Austria												
Tangibles	17.1%	14.6%	15.1%	-2.0%	1.8%	-5.0%	3.5%	1.8%	2.0%	0.8%	1.2%	-0.8%
Non-ICT tangibles	15.0%	13.2%	13.7%	-1.3%	1.7%	-5.5%	3.5%	1.8%	1.9%	0.9%	1.2%	-0.7%
ICT tangibles	2.0%	1.4%	1.4%	-0.7%	0.8%	-1.1%	4.2%	3.4%	2.8%	-0.1%	1.6%	-1.2%
Intangibles	7.8%	9.2%	10.6%	2.8%	5.4%	1.8%	4.0%	-1.4%	5.6%	3.9%	4.3%	-1.3%
Intangibles - technology-related	3.8%	4.6%	6.0%	2.2%	7.2%	3.0%	6.1%	-1.0%	5.9%	4.5%	5.2%	-0.7%
Intangibles - business innovation-related	4.0%	4.5%	4.6%	0.6%	3.9%	0.6%	1.3%	-2.6%	5.0%	2.7%	2.0%	-3.0%
TOTAL	24.9%	23.8%	25.7%	0.8%	2.9%	-2.4%	3.7%	0.8%	2.0%	0.8%	1.2%	-0.8%
Germany												
Tangibles	13.1%	12.2%	11.6%	-1.6%	1.9%	-2.7%	2.5%	0.6%	1.0%	0.3%	0.2%	-0.8%
Non-ICT tangibles	11.6%	11.2%	10.7%	-0.8%	0.7%	-2.9%	2.5%	1.8%	0.7%	0.1%	0.2%	-0.5%
ICT tangibles	1.6%	1.0%	0.8%	-0.7%	9.1%	0.5%	1.9%	-7.2%	6.8%	3.1%	0.6%	-6.2%
Intangibles	10.2%	10.7%	11.6%	1.5%	2.2%	0.3%	3.7%	1.4%	2.1%	1.5%	2.8%	0.7%
Intangibles - technology-related	3.7%	4.1%	4.4%	0.7%	2.5%	1.7%	4.2%	1.7%	2.2%	2.1%	2.8%	0.6%
Intangibles - business innovation-related	6.5%	6.6%	7.2%	0.8%	2.1%	-0.6%	3.4%	1.3%	2.3%	0.8%	3.1%	0.8%
TOTAL	23.3%	22.9%	23.2%	-0.1%	2.1%	-1.3%	3.1%	1.0%	1.2%	0.5%	0.8%	-0.4%
Denmark												
Tangibles	15.6%	12.9%	12.4%	-3.2%	3.0%	-11.3%	3.5%	0.5%	1.8%	0.3%	0.7%	-1.1%
Non-ICT tangibles	13.8%	11.9%	11.3%	-2.4%	2.2%	-12.2%	3.1%	0.8%	1.6%	0.4%	0.6%	-1.0%
ICT tangibles	1.9%	1.1%	1.1%	-0.8%	7.6%	-9.8%	8.3%	0.8%	5.9%	-2.4%	6.1%	0.2%
Intangibles	13.1%	15.5%	15.3%	2.3%	4.8%	0.5%	3.5%	-1.4%	4.1%	2.5%	2.3%	-1.8%
Intangibles - technology-related	4.6%	6.4%	6.4%	1.8%	7.0%	8.4%	2.6%	-4.4%	5.6%	5.7%	2.3%	-3.3%
Intangibles - business innovation-related	8.4%	9.2%	8.9%	0.5%	3.8%	-4.5%	4.1%	0.3%	3.3%	0.7%	2.6%	-0.7%
TOTAL	28.7%	28.5%	27.8%	-0.9%	3.9%	-5.0%	3.5%	-0.4%	2.2%	0.8%	1.1%	-1.1%
Spain												
Tangibles	17.4%	14.4%	13.3%	-4.1%	5.4%	-13.1%	2.8%	-2.6%	4.1%	1.7%	0.9%	-3.2%
Non-ICT tangibles	16.5%	13.7%	12.6%	-3.9%	5.0%	-13.2%	2.6%	-2.5%	4.1%	1.6%	0.8%	-3.3%
ICT tangibles	0.9%	0.6%	0.7%	-0.2%	6.9%	-10.9%	5.4%	-1.5%	4.0%	1.3%	3.5%	-0.5%
Intangibles	7.0%	8.4%	9.7%	2.7%	5.5%	0.4%	2.6%	-2.9%	5.1%	3.5%	2.4%	-2.7%
Intangibles - technology-related	2.1%	3.0%	4.1%	2.0%	7.4%	4.9%	3.3%	-4.1%	6.3%	5.7%	4.0%	-2.3%
Intangibles - business innovation-related	5.0%	5.4%	5.7%	0.7%	4.7%	-2.2%	2.1%	-2.6%	4.7%	1.8%	1.1%	-3.6%
TOTAL	24.4%	22.8%	23.0%	-1.4%	5.4%	-8.1%	2.7%	-2.7%	4.3%	1.9%	1.1%	-3.2%

Appendix Table 1 (continued) – Investment/Value Added Shares, Real Investment Growth and Capital Stock Growth, Tangible and Intangibles, Market Economy, 1996-2007 and 2011-2019

	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007
	Investment/value Added share (%)				Real Investment				Real Capital Stocks (average annual % growth)			
Finland												
Tangibles	11.3%	10.0%	10.3%	-1.1%	3.7%	-6.7%	3.2%	-0.5%	0.3%	-0.1%	0.4%	0.1%
Non-ICT tangibles	10.5%	9.2%	9.5%	-1.0%	3.2%	-7.1%	3.1%	-0.1%	0.0%	-0.3%	0.2%	0.2%
ICT tangibles	0.8%	0.8%	0.8%	0.0%	13.2%	-0.9%	4.9%	-8.2%	17.0%	11.9%	7.0%	-10.0%
Intangibles	14.4%	16.7%	16.6%	2.2%	4.4%	-0.6%	0.9%	-3.5%	4.2%	1.2%	0.2%	-4.1%
Intangibles - technology-related	5.4%	6.7%	5.6%	0.1%	6.8%	-1.0%	-1.8%	-8.6%	6.3%	1.7%	-2.4%	-8.8%
Intangibles - business innovation-related	9.0%	10.0%	11.0%	2.0%	3.1%	-0.3%	2.4%	-0.7%	3.0%	1.1%	2.5%	-0.5%
TOTAL	25.7%	26.7%	26.8%	1.1%	4.1%	-2.9%	1.6%	-2.4%	1.3%	0.3%	0.3%	-1.0%
France												
Tangibles	10.5%	10.6%	10.8%	0.3%	4.7%	-4.2%	2.9%	-1.8%	1.8%	0.3%	0.9%	-0.9%
Non-ICT tangibles	9.8%	10.0%	10.2%	0.4%	4.7%	-4.5%	2.7%	-2.0%	1.4%	0.2%	0.8%	-0.6%
ICT tangibles	0.7%	0.6%	0.6%	-0.1%	6.2%	1.4%	7.3%	1.1%	6.5%	2.6%	5.8%	-0.7%
Intangibles	16.1%	17.5%	19.1%	3.0%	2.8%	2.2%	3.3%	0.5%	2.1%	2.2%	2.9%	0.8%
Intangibles - technology-related	6.0%	6.6%	7.4%	1.4%	3.6%	2.8%	3.9%	0.3%	2.0%	2.6%	2.9%	0.9%
Intangibles - business innovation-related	10.1%	10.9%	11.8%	1.6%	2.3%	1.9%	2.9%	0.6%	2.4%	2.0%	3.1%	0.7%
TOTAL	26.6%	28.1%	29.9%	3.3%	3.5%	-0.4%	3.2%	-0.4%	1.9%	1.0%	1.7%	-0.2%
Italy												
Tangibles	14.4%	13.8%	12.5%	-1.9%	3.0%	-5.9%	0.2%	-2.8%	2.1%	0.3%	-0.6%	-2.7%
Non-ICT tangibles	13.3%	12.9%	11.6%	-1.8%	2.8%	-6.3%	0.1%	-2.6%	1.9%	0.3%	-0.7%	-2.6%
ICT tangibles	1.0%	0.9%	0.9%	-0.1%	6.7%	1.0%	1.8%	-4.9%	7.0%	-0.2%	1.8%	-5.2%
Intangibles	9.9%	10.5%	11.2%	1.3%	2.4%	-1.5%	1.7%	-0.7%	2.4%	0.1%	1.1%	-1.2%
Intangibles - technology-related	3.3%	3.6%	4.1%	0.7%	2.8%	1.0%	2.9%	0.1%	3.0%	1.5%	2.2%	-0.8%
Intangibles - business innovation-related	6.6%	6.9%	7.2%	0.6%	2.2%	-2.7%	1.0%	-1.2%	2.0%	-0.7%	0.4%	-1.6%
TOTAL	24.3%	24.3%	23.8%	-0.6%	2.8%	-4.1%	0.8%	-1.9%	2.1%	0.3%	-0.3%	-2.4%
Netherlands												
Tangibles	11.2%	9.1%	10.0%	-1.2%	2.8%	-3.8%	5.1%	2.3%	1.2%	0.2%	1.0%	-0.2%
Non-ICT tangibles	10.3%	8.4%	9.2%	-1.1%	1.5%	-4.3%	5.2%	3.7%	0.9%	0.1%	1.0%	0.1%
ICT tangibles	0.9%	0.7%	0.7%	-0.2%	18.9%	0.9%	6.5%	-12.4%	17.2%	7.7%	4.5%	-12.7%
Intangibles	13.2%	13.4%	15.5%	2.4%	4.9%	-4.2%	4.9%	-0.1%	3.4%	1.1%	3.4%	0.0%
Intangibles - technology-related	3.9%	4.1%	5.2%	1.3%	10.5%	-11.4%	11.7%	1.3%	4.5%	0.8%	3.7%	-0.8%
Intangibles - business innovation-related	9.3%	9.3%	10.4%	1.1%	2.6%	0.8%	3.8%	1.1%	2.9%	1.4%	3.4%	0.5%
TOTAL	24.4%	22.5%	25.5%	1.1%	4.0%	-4.3%	4.7%	0.7%	1.7%	0.4%	1.7%	-0.1%

Appendix Table 1 (continued) – Investment/Value Added Shares, Real Investment Growth and Capital Stock Growth, Tangible and Intangibles, Market Economy, 1996-2007 and 2011-2019

	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996- 2007
	Investment/value Added share (%)				Real Investment				Real Capital Stocks (average annual % growth)			
Sweden												
Tangibles	14.0%	14.0%	13.2%	-0.8%	5.3%	-2.1%	3.5%	-1.8%	2.8%	2.8%	2.0%	-0.9%
Non-ICT tangibles	11.4%	12.2%	11.8%	0.4%	4.0%	-2.1%	3.3%	-0.7%	2.4%	2.6%	2.0%	-0.4%
ICT tangibles	2.6%	1.7%	1.4%	-1.2%	8.6%	-3.1%	5.2%	-3.5%	9.4%	6.8%	3.3%	-6.1%
Intangibles	17.2%	17.9%	19.1%	1.9%	3.1%	1.6%	3.5%	0.4%	3.7%	2.6%	3.3%	-0.3%
Intangibles - technology-related	8.6%	8.8%	8.5%	-0.1%	4.1%	0.5%	2.3%	-1.8%	5.0%	2.4%	2.1%	-2.8%
Intangibles - business innovation-related	8.5%	9.1%	10.6%	2.1%	2.2%	2.7%	4.6%	2.4%	2.1%	3.1%	5.1%	2.9%
TOTAL	31.2%	31.8%	32.3%	1.1%	4.0%	-0.1%	3.5%	-0.5%	3.0%	2.7%	2.4%	-0.7%
United Kingdom												
Tangibles	11.7%	9.0%	9.9%	-1.8%	3.3%	-7.7%	3.1%	-0.2%	2.8%	0.0%	1.1%	-1.6%
Non-ICT tangibles	10.1%	8.3%	9.1%	-1.1%	2.0%	-7.8%	4.0%	2.0%	2.2%	-0.1%	1.2%	-1.0%
ICT tangibles	1.5%	0.8%	0.8%	-0.8%	12.0%	-8.3%	0.0%	-12.0%	12.7%	2.0%	-0.1%	-12.9%
Intangibles	14.9%	15.2%	16.2%	1.3%	4.0%	-1.6%	4.4%	0.4%	3.8%	1.3%	3.5%	-0.3%
Intangibles - technology-related	4.2%	4.1%	4.3%	0.1%	3.6%	2.6%	2.8%	-0.9%	3.8%	2.2%	3.1%	-0.7%
Intangibles - business innovation-related	10.8%	11.1%	11.9%	1.1%	4.2%	-3.0%	5.0%	0.8%	3.8%	0.9%	3.5%	-0.3%
TOTAL	26.6%	24.2%	26.1%	-0.6%	3.6%	-4.2%	3.9%	0.3%	3.0%	0.4%	1.9%	-1.2%
United States												
Tangibles	11.2%	9.4%	10.1%	-1.1%	5.3%	-5.1%	5.2%	-0.1%	2.8%	0.9%	1.8%	-0.9%
Non-ICT tangibles	9.0%	7.7%	8.5%	-0.5%	2.5%	-8.0%	4.8%	2.3%	2.0%	0.5%	1.5%	-0.5%
ICT tangibles	2.3%	1.8%	1.6%	-0.6%	15.5%	8.7%	7.4%	-8.1%	12.5%	9.9%	9.2%	-3.3%
Intangibles	15.1%	16.8%	17.7%	2.6%	4.5%	-0.5%	5.2%	0.7%	3.6%	1.2%	3.3%	-0.3%
Intangibles - technology-related	5.6%	6.5%	7.1%	1.5%	6.8%	0.9%	5.3%	-1.5%	4.1%	2.1%	2.9%	-1.2%
Intangibles - business innovation-related	9.5%	10.2%	10.6%	1.1%	3.2%	-1.4%	5.1%	1.9%	4.1%	0.6%	4.2%	0.1%
TOTAL	26.3%	26.2%	27.8%	1.5%	4.8%	-2.3%	5.2%	0.4%	3.0%	1.0%	2.3%	-0.7%

Note: Market economy excludes public administration (NACE Sector O), education (P), health care (Q), activities of households (T) and extra-territorial organisation (U), as well as real estate (L). "Intangibles –technology-related" are measured as part of GDP and included in the national accounts; "intangibles – business-innovation related" are not included in GDP in the national accounts (see Figure 1).

Source: EUKLEMS-INTANProd, 2023 (<https://euklems-intanprod-ilee.luiss.it/>)

Appendix Table 2 – Growth Accounting Decomposition of Labour Productivity into Contributions of Tangible and Intangible Capital and Total Factor Productivity, Market Economy, 1996-2007 and 2011-2019

	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007	1996-2007	2008-2010	2011-2019	contribution to the slowdown: 2011-2019 minus 1996-2007
	Absolute Contributions to Labour Productivity Growth (average annual % growth)				Relative Contributions to Labour Productivity Growth (%)			
Austria								
Labor productivity growth	2.5%	0.1%	1.0%	-1.5%	100%	100%	100%	100%
Labor composition	0.3%	0.2%	-0.1%	-0.4%	13%	367%	-7%	25%
Tangible capital deepening	0.5%	0.5%	0.2%	-0.3%	22%	867%	20%	23%
Non-ICT tangible capital deepening	0.4%	0.4%	0.1%	-0.2%	14%	667%	11%	16%
ICT tangible capital deepening	0.2%	0.1%	0.1%	-0.1%	8%	217%	10%	6%
Intangible capital deepening	0.4%	0.5%	0.4%	0.0%	17%	817%	42%	1%
Technology-related intangible capital deepening	0.3%	0.3%	0.4%	0.1%	11%	567%	39%	-7%
Business innovation-related intangibles capital deepening	0.1%	0.2%	0.0%	-0.1%	6%	250%	3%	7%
Total Factor Productivity	1.2%	-1.2%	0.4%	-0.8%	49%	-1967%	45%	51%
Germany								
Labor productivity growth	1.9%	-0.7%	1.5%	-0.4%	100%	100%	100%	100%
Labor composition	-0.1%	0.5%	0.2%	0.3%	-4%	-64%	15%	-67%
Tangible capital deepening	0.6%	0.3%	0.1%	-0.5%	32%	-44%	10%	107%
Non-ICT tangible capital deepening	0.3%	0.2%	0.1%	-0.2%	17%	-32%	7%	53%
ICT tangible capital deepening	0.3%	0.1%	0.0%	-0.2%	14%	-11%	3%	53%
Intangible capital deepening	0.3%	0.2%	0.3%	0.1%	13%	-29%	23%	-21%
Technology-related intangible capital deepening	0.1%	0.1%	0.2%	0.1%	5%	-19%	10%	-12%
Business innovation-related intangibles capital deepening	0.2%	0.1%	0.2%	0.0%	8%	-10%	13%	-9%
Total Factor Productivity	1.1%	-1.7%	0.8%	-0.4%	59%	237%	52%	84%
Denmark								
Labor productivity growth	1.8%	0.7%	1.6%	-0.3%	100%	100%	100%	100%
Labor composition	0.5%	0.7%	0.2%	-0.3%	24%	94%	10%	103%
Tangible capital deepening	0.6%	0.8%	0.1%	-0.5%	33%	113%	5%	183%
Non-ICT tangible capital deepening	0.3%	0.8%	0.0%	-0.2%	14%	108%	1%	83%
ICT tangible capital deepening	0.3%	0.0%	0.1%	-0.3%	18%	4%	3%	100%
Intangible capital deepening	0.6%	0.9%	0.5%	-0.1%	32%	131%	30%	41%
Technology-related intangible capital deepening	0.4%	0.7%	0.3%	-0.1%	19%	93%	18%	24%
Business innovation-related intangibles capital deepening	0.2%	0.3%	0.2%	-0.1%	13%	38%	11%	21%
Total Factor Productivity	0.2%	-1.7%	0.9%	0.7%	12%	-238%	56%	-224%

Appendix Table 2 (continued) – Growth Accounting Decomposition of Labour Productivity into Contributions of Tangible and Intangible Capital and Total Factor Productivity, Market Economy, 1996-2007 and 2011-2019

	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007	1996-2007	2008-2010	2011-2019	contribution to the slowdown: 2011- 2019 minus 1996- 2007
	Absolute Contributions to Labour Productivity				Relative Contributions to Labour Productivity Growth (%)			
Spain								
Labor productivity growth	0.1%	1.9%	0.9%	0.8%	100%	100%	100%	100%
Labor composition	0.1%	0.7%	0.5%	0.3%	118%	39%	52%	43%
Tangible capital deepening	0.6%	1.6%	0.3%	-0.3%	527%	85%	29%	-41%
Non-ICT tangible capital deepening	0.5%	1.5%	0.2%	-0.3%	409%	81%	22%	-32%
ICT tangible capital deepening	0.1%	0.1%	0.1%	-0.1%	118%	4%	7%	-9%
Intangible capital deepening	0.2%	0.7%	0.3%	0.1%	182%	37%	34%	14%
Technology-related intangible capital deepening	0.2%	0.4%	0.3%	0.1%	136%	20%	28%	13%
Business innovation-related intangibles capital deepening	0.1%	0.3%	0.1%	0.0%	45%	17%	7%	1%
Total Factor Productivity	-0.8%	-1.2%	-0.1%	0.7%	-718%	-62%	-16%	82%
Finland								
Labor productivity growth	3.3%	-0.7%	0.7%	-2.6%	100%	100%	100%	100%
Labor composition	0.2%	0.2%	0.2%	0.0%	7%	-20%	28%	1%
Tangible capital deepening	-0.1%	0.4%	0.1%	0.2%	-2%	-55%	18%	-7%
Non-ICT tangible capital deepening	-0.2%	0.3%	0.1%	0.2%	-5%	-39%	9%	-9%
ICT tangible capital deepening	0.1%	0.1%	0.1%	-0.1%	3%	-16%	8%	2%
Intangible capital deepening	0.5%	0.6%	0.1%	-0.4%	15%	-74%	16%	14%
Technology-related intangible capital deepening	0.3%	0.3%	-0.1%	-0.4%	10%	-38%	-9%	16%
Business innovation-related intangibles capital deepening	0.2%	0.3%	0.2%	0.0%	4%	-36%	26%	-2%
Total Factor Productivity	2.7%	-1.9%	0.3%	-2.4%	80%	251%	38%	92%
France								
Labor productivity growth	2.0%	-0.1%	1.1%	-0.9%	100%	100%	100%	100%
Labor composition	0.3%	0.6%	0.6%	0.3%	16%	-475%	60%	-36%
Tangible capital deepening	0.6%	0.3%	0.2%	-0.4%	29%	-283%	16%	45%
Non-ICT tangible capital deepening	0.5%	0.3%	0.1%	-0.3%	24%	-242%	12%	37%
ICT tangible capital deepening	0.1%	0.1%	0.1%	-0.1%	6%	-42%	5%	7%
Intangible capital deepening	0.4%	0.6%	0.6%	0.2%	22%	-508%	54%	-16%
Technology-related intangible capital deepening	0.3%	0.4%	0.3%	0.1%	13%	-292%	30%	-7%
Business innovation-related intangibles capital deepening	0.2%	0.3%	0.3%	0.1%	9%	-217%	24%	-9%
Total Factor Productivity	0.7%	-1.7%	-0.3%	-1.0%	34%	1375%	-30%	108%

Appendix Table 2 (continued) – Growth Accounting Decomposition of Labour Productivity into Contributions of Tangible and Intangible Capital and Total Factor Productivity, Market Economy, 1996-2007 and 2011-2019

	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007	1996-2007	2008-2010	2011-2019	contribution to the slowdown: 2011- 2019 minus 1996- 2007
	Absolute Contributions to Labour Productivity				Relative Contributions to Labour Productivity Growth (%)			
Italy								
Labor productivity growth	0.7%	-0.3%	0.5%	-0.2%	100%	100%	100%	100%
Labor composition	0.3%	0.4%	0.5%	0.3%	34%	-128%	100%	-118%
Tangible capital deepening	0.6%	0.6%	0.1%	-0.5%	82%	-214%	16%	236%
Non-ICT tangible capital deepening	0.4%	0.5%	0.0%	-0.4%	59%	-186%	2%	191%
ICT tangible capital deepening	0.2%	0.1%	0.1%	-0.1%	23%	-28%	14%	45%
Intangible capital deepening	0.3%	0.3%	0.2%	-0.1%	37%	-97%	43%	23%
Technology-related intangible capital deepening	0.2%	0.2%	0.2%	0.0%	26%	-72%	31%	14%
Business innovation-related intangibles capital deepening	0.1%	0.1%	0.1%	0.0%	11%	-24%	10%	14%
Total Factor Productivity	-0.4%	-1.6%	-0.3%	0.1%	-52%	538%	-59%	-36%
Netherlands								
Labor productivity growth	2.1%	0.4%	0.5%	-1.7%	100%	100%	100%	100%
Labor composition	0.3%	0.3%	0.5%	0.1%	15%	58%	92%	-8%
Tangible capital deepening	0.3%	0.4%	0.1%	-0.2%	13%	86%	10%	13%
Non-ICT tangible capital deepening	0.0%	0.3%	0.0%	0.0%	2%	65%	2%	2%
ICT tangible capital deepening	0.2%	0.1%	0.0%	-0.2%	11%	21%	8%	12%
Intangible capital deepening	0.4%	0.4%	0.5%	0.1%	20%	86%	96%	-3%
Technology-related intangible capital deepening	0.3%	0.2%	0.2%	-0.1%	13%	37%	45%	3%
Business innovation-related intangibles capital deepening	0.2%	0.2%	0.3%	0.1%	7%	51%	51%	-5%
Total Factor Productivity	1.1%	-0.6%	-0.5%	-1.6%	53%	-130%	-98%	98%
Sweden								
Labor productivity growth	3.6%	0.1%	1.7%	-2.0%	100%	100%	100%	100%
Labor composition	0.5%	0.1%	0.2%	-0.3%	14%	163%	10%	17%
Tangible capital deepening	0.9%	0.6%	0.4%	-0.6%	26%	725%	21%	30%
Non-ICT tangible capital deepening	0.5%	0.5%	0.3%	-0.3%	14%	563%	16%	13%
ICT tangible capital deepening	0.4%	0.1%	0.1%	-0.3%	12%	163%	5%	17%
Intangible capital deepening	0.8%	0.5%	0.6%	-0.2%	22%	625%	39%	8%
Technology-related intangible capital deepening	0.7%	0.3%	0.2%	-0.4%	18%	313%	13%	22%
Business innovation-related intangibles capital deepening	0.1%	0.3%	0.4%	0.3%	4%	313%	25%	-15%
Total Factor Productivity	1.4%	-1.1%	0.5%	-0.9%	38%	-1425%	31%	45%

Appendix Table 2 (continued) – Growth Accounting Decomposition of Labour Productivity into Contributions of Tangible and Intangible Capital and Total Factor Productivity, Market Economy, 1996-2007 and 2011-2019

	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007	1996-2007	2008-2010	2011-2019	contribution to the slowdown: 2011-2019 minus 1996-2007
	Absolute Contributions to Labour Productivity				Relative Contributions to Labour Productivity Growth (%)			
United Kingdom								
Labor productivity growth	2.7%	0.0%	0.7%	-2.0%	100%	100%	100%	100%
Labor composition	0.3%	0.2%	0.2%	-0.2%	13%	2400%	29%	7%
Tangible capital deepening	0.7%	0.5%	0.1%	-0.6%	25%	5400%	11%	29%
Non-ICT tangible capital deepening	0.4%	0.5%	0.1%	-0.3%	13%	5100%	8%	15%
ICT tangible capital deepening	0.3%	0.0%	0.0%	-0.3%	12%	400%	3%	15%
Intangible capital deepening	0.5%	0.4%	0.3%	-0.2%	19%	4400%	46%	11%
Technology-related intangible capital deepening	0.1%	0.2%	0.0%	-0.1%	4%	1700%	0%	5%
Business innovation-related intangibles capital deepening	0.4%	0.3%	0.3%	-0.1%	15%	2700%	46%	5%
Total Factor Productivity	1.2%	-1.2%	0.1%	-1.1%	43%	-12100%	14%	52%
United States								
Labor productivity growth	2.8%	2.5%	1.2%	-1.7%	100%	100%	100%	100%
Labor composition	0.4%	0.5%	0.2%	-0.2%	13%	20%	15%	11%
Tangible capital deepening	0.8%	0.9%	0.2%	-0.6%	27%	37%	15%	35%
Non-ICT tangible capital deepening	0.3%	0.6%	0.0%	-0.2%	9%	22%	3%	13%
ICT tangible capital deepening	0.5%	0.4%	0.2%	-0.4%	18%	15%	14%	21%
Intangible capital deepening	0.7%	1.1%	0.6%	-0.1%	24%	46%	52%	4%
Intangible capital deepening - national accounts	0.4%	0.7%	0.3%	-0.1%	15%	28%	25%	8%
Intangibles capital deepening - non-national accounts	0.3%	0.5%	0.3%	0.1%	9%	18%	26%	-3%
Total Factor Productivity	1.0%	-0.1%	0.2%	-0.8%	36%	-3%	17%	50%

Note: Market economy excludes public administration (NACE Sector O), education (P), health care (Q), activities of households (T) and extra-territorial organisation (U), as well as real estate (L). "Intangibles –technology-related" are measured as part of GDP and included in the national accounts; "intangibles – business-innovation related" are not included in GDP in the national accounts (see Figure 1).

Source: EUKLEMS-INTANProd, 2023 (<https://euklems-intanprod-ilee.luiss.it/>)

Appendix Table 3 – Growth Accounting Decomposition of Labour Productivity into Contributions of Tangible and Intangible Capital and Total Factor Productivity, Intangible-Intensive and Less Intangible Intensive Industry Groups, Absolute Contributions to Labour Productivity Growth (average annual % growth), 1996-2007 and 2011-2019

	Intangible-intensive industries				Less intangible-intensive industries			
	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007
	Absolute Contributions to Labour Productivity Growth (average annual % growth)				Absolute Contributions to Labour Productivity Growth (average annual % growth)			
Austria								
Labor productivity growth	1.3%	0.1%	0.5%	-0.8%	1.0%	-0.5%	0.2%	-0.7%
Labor composition	0.1%	0.0%	-0.2%	-0.3%	0.1%	0.1%	-0.1%	-0.2%
Tangible capital deepening	0.3%	0.3%	0.1%	-0.2%	0.3%	0.2%	0.1%	-0.2%
Non-ICT tangible capital deepening	0.2%	0.2%	0.1%	-0.2%	0.2%	0.1%	0.0%	-0.2%
ICT tangible capital deepening	0.1%	0.1%	0.0%	0.0%	0.1%	0.1%	0.1%	0.0%
Intangible capital deepening	0.3%	0.3%	0.3%	0.0%	0.2%	0.2%	0.1%	0.0%
Technology-related intangible capital deepening	0.2%	0.3%	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%
Business innovation-related intangibles capital deepening	0.1%	0.0%	0.0%	-0.1%	0.1%	0.1%	0.0%	0.0%
Total Factor Productivity	0.7%	-0.6%	0.3%	-0.3%	0.4%	-1.0%	0.1%	-0.4%
Germany								
Labor productivity growth	0.7%	-0.3%	0.8%	0.0%	0.9%	-0.3%	0.5%	-0.3%
Labor composition	-0.1%	0.3%	0.1%	0.2%	0.0%	0.2%	0.1%	0.1%
Tangible capital deepening	0.2%	0.1%	0.0%	-0.2%	0.2%	0.2%	0.1%	-0.1%
Non-ICT tangible capital deepening	0.1%	0.1%	0.0%	-0.1%	0.1%	0.1%	0.1%	-0.1%
ICT tangible capital deepening	0.2%	0.1%	0.0%	-0.1%	0.1%	0.0%	0.0%	-0.1%
Intangible capital deepening	0.2%	0.2%	0.3%	0.1%	0.1%	0.1%	0.1%	0.0%
Technology-related intangible capital deepening	0.1%	0.2%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%
Business innovation-related intangibles capital deepening	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%
Total Factor Productivity	0.4%	-1.0%	0.4%	0.0%	0.6%	-0.7%	0.3%	-0.3%
Denmark								
Labor productivity growth	1.1%	-0.1%	0.9%	-0.2%	0.7%	-0.1%	0.8%	0.1%
Labor composition	0.2%	0.3%	0.1%	-0.1%	0.1%	0.3%	0.1%	-0.1%
Tangible capital deepening	0.3%	0.1%	0.2%	-0.1%	0.4%	0.3%	0.0%	-0.4%
Non-ICT tangible capital deepening	0.1%	0.1%	0.2%	0.1%	0.2%	0.2%	0.0%	-0.3%
ICT tangible capital deepening	0.2%	0.0%	0.0%	-0.2%	0.2%	0.0%	0.0%	-0.1%
Intangible capital deepening	0.4%	0.5%	0.4%	0.1%	0.2%	0.3%	0.1%	0.0%
Technology-related intangible capital deepening	0.3%	0.5%	0.3%	0.0%	0.1%	0.1%	0.0%	-0.1%
Business innovation-related intangibles capital deepening	0.1%	0.1%	0.1%	0.0%	0.1%	0.2%	0.1%	0.0%
Total Factor Productivity	0.2%	-1.0%	0.1%	-0.1%	0.0%	-0.8%	0.6%	0.6%

Appendix Table 3 (continued)– Growth Accounting Decomposition of Labour Productivity into Contributions of Tangible and Intangible Capital and Total Factor Productivity, Intangible-Intensive and Less Intangible Intensive Industry Groups, Absolute Contributions to Labour Productivity Growth (average annual % growth), 1996-2007 and 2011-2019

	Intangible-intensive industries				Less intangible-intensive industries			
	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007
	Absolute Contributions to Labour Productivity Growth (average annual % growth)				Absolute Contributions to Labour Productivity Growth (average annual % growth)			
Spain								
Labor productivity growth	0.5%	0.0%	0.3%	-0.2%	-0.3%	1.7%	0.6%	1.0%
Labor composition	-0.1%	0.2%	0.2%	0.2%	0.1%	0.3%	0.2%	0.2%
Tangible capital deepening	0.2%	0.3%	0.1%	-0.2%	0.4%	1.3%	0.3%	-0.1%
Non-ICT tangible capital deepening	0.2%	0.3%	0.0%	-0.1%	0.4%	1.3%	0.3%	-0.1%
ICT tangible capital deepening	0.1%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Intangible capital deepening	0.2%	0.4%	0.2%	0.0%	0.1%	0.3%	0.1%	0.0%
Technology-related intangible capital deepening	0.1%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.0%
Business innovation-related intangibles capital deepening	0.1%	0.2%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
Total Factor Productivity	0.1%	-0.7%	-0.1%	-0.2%	-0.9%	-0.3%	0.0%	0.9%
Finland								
Labor productivity growth	2.2%	-0.2%	0.3%	-1.9%	1.2%	-0.3%	0.5%	-0.6%
Labor composition	0.0%	0.1%	0.1%	0.1%	0.1%	0.0%	0.1%	0.0%
Tangible capital deepening	0.1%	0.2%	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%
Non-ICT tangible capital deepening	0.0%	0.1%	0.0%	0.0%	-0.1%	0.2%	0.2%	0.2%
ICT tangible capital deepening	0.1%	0.1%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%
Intangible capital deepening	0.5%	0.8%	0.1%	-0.4%	0.1%	0.2%	0.2%	0.1%
Technology-related intangible capital deepening	0.4%	0.5%	0.0%	-0.4%	0.1%	0.1%	0.1%	0.0%
Business innovation-related intangibles capital deepening	0.1%	0.3%	0.1%	0.0%	0.1%	0.1%	0.2%	0.1%
Total Factor Productivity	1.6%	-1.3%	0.1%	-1.5%	1.0%	-0.7%	0.1%	-0.9%
France								
Labor productivity growth	1.1%	0.2%	0.6%	-0.5%	0.8%	-0.4%	0.4%	-0.4%
Labor composition	0.1%	0.2%	0.2%	0.1%	0.1%	0.3%	0.2%	0.1%
Tangible capital deepening	0.4%	0.2%	0.1%	-0.3%	0.3%	0.2%	0.2%	-0.1%
Non-ICT tangible capital deepening	0.3%	0.2%	0.1%	-0.3%	0.3%	0.2%	0.1%	-0.1%
ICT tangible capital deepening	0.1%	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%
Intangible capital deepening	0.5%	0.5%	0.4%	-0.1%	0.0%	0.2%	0.2%	0.1%
Technology-related intangible capital deepening	0.3%	0.3%	0.2%	-0.1%	0.0%	0.1%	0.1%	0.1%
Business innovation-related intangibles capital deepening	0.1%	0.2%	0.2%	0.0%	0.1%	0.1%	0.1%	0.0%
Total Factor Productivity	0.2%	-0.8%	-0.1%	-0.2%	0.3%	-1.0%	-0.2%	-0.5%

Appendix Table 3 (continued)– Growth Accounting Decomposition of Labour Productivity into Contributions of Tangible and Intangible Capital and Total Factor Productivity, Intangible-Intensive and Less Intangible Intensive Industry Groups, Absolute Contributions to Labour Productivity Growth (average annual % growth), 1996-2007 and 2011-2019

	Intangible-intensive industries				Less intangible-intensive industries			
	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007
	Absolute Contributions to Labour Productivity Growth (average annual % growth)				Absolute Contributions to Labour Productivity Growth (average annual % growth)			
Italy								
Labor productivity growth	0.2%	-0.2%	0.2%	0.0%	0.3%	-0.2%	0.3%	0.0%
Labor composition	0.1%	0.1%	0.2%	0.2%	0.1%	0.2%	0.2%	0.1%
Tangible capital deepening	0.3%	0.3%	0.1%	-0.2%	0.4%	0.4%	0.0%	-0.4%
Non-ICT tangible capital deepening	0.1%	0.2%	0.0%	-0.1%	0.4%	0.3%	0.0%	-0.4%
ICT tangible capital deepening	0.1%	0.1%	0.1%	-0.1%	0.1%	0.0%	0.0%	-0.1%
Intangible capital deepening	0.1%	0.2%	0.2%	0.0%	0.1%	0.1%	0.1%	0.0%
Technology-related intangible capital deepening	0.1%	0.2%	0.1%	0.0%	0.1%	0.0%	0.1%	0.0%
Business innovation-related intangibles capital deepening	0.0%	0.0%	0.1%	0.0%	0.1%	0.1%	0.0%	0.0%
Total Factor Productivity	-0.2%	-0.8%	-0.3%	-0.1%	-0.3%	-0.9%	0.1%	0.4%
Netherlands								
Labor productivity growth	1.4%	0.5%	0.2%	-1.2%	1.0%	-0.1%	0.6%	-0.4%
Labor composition	0.2%	0.2%	0.2%	0.1%	0.1%	0.1%	0.2%	0.1%
Tangible capital deepening	0.3%	0.2%	0.1%	-0.2%	0.2%	0.2%	0.0%	-0.2%
Non-ICT tangible capital deepening	0.2%	0.2%	0.1%	-0.1%	0.1%	0.2%	0.0%	-0.1%
ICT tangible capital deepening	0.1%	0.1%	0.0%	-0.1%	0.1%	0.0%	0.0%	-0.1%
Intangible capital deepening	0.3%	0.3%	0.4%	0.0%	0.1%	0.1%	0.2%	0.1%
Technology-related intangible capital deepening	0.2%	0.1%	0.1%	-0.1%	0.1%	0.1%	0.1%	0.0%
Business innovation-related intangibles capital deepening	0.1%	0.2%	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%
Total Factor Productivity	0.5%	-0.2%	-0.5%	-1.0%	0.6%	-0.5%	0.2%	-0.4%
Sweden								
Labor productivity growth	2.2%	0.3%	1.0%	-1.3%	1.3%	-0.4%	0.7%	-0.5%
Labor composition	0.3%	0.1%	0.1%	-0.3%	0.1%	0.0%	0.1%	0.0%
Tangible capital deepening	0.4%	0.2%	0.2%	-0.2%	0.6%	0.4%	0.2%	-0.3%
Non-ICT tangible capital deepening	0.2%	0.1%	0.1%	-0.1%	0.3%	0.3%	0.2%	-0.1%
ICT tangible capital deepening	0.2%	0.1%	0.1%	-0.1%	0.2%	0.1%	0.0%	-0.2%
Intangible capital deepening	0.6%	0.5%	0.5%	-0.2%	0.2%	0.3%	0.4%	0.2%
Technology-related intangible capital deepening	0.5%	0.4%	0.3%	-0.3%	0.1%	0.1%	0.1%	0.0%
Business innovation-related intangibles capital deepening	0.1%	0.1%	0.2%	0.1%	0.0%	0.2%	0.3%	0.3%
Total Factor Productivity	0.9%	-0.5%	0.3%	-0.6%	0.4%	-1.1%	0.1%	-0.4%

Appendix Table 3 (continued)– Growth Accounting Decomposition of Labour Productivity into Contributions of Tangible and Intangible Capital and Total Factor Productivity, Intangible-Intensive and Less Intangible Intensive Industry Groups, Absolute Contributions to Labour Productivity Growth (average annual % growth), 1996-2007 and 2011-2019

	Intangible-intensive industries				Less intangible-intensive industries			
	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007	1996-2007	2008-2010	2011-2019	slowdown: 2011-2019 minus 1996-2007
	Absolute Contributions to Labour Productivity Growth (average annual % growth)				Absolute Contributions to Labour Productivity Growth (average annual % growth)			
United Kingdom								
Labor productivity growth	2.0%	0.2%	0.6%	-1.5%	0.6%	-0.4%	0.2%	-0.5%
Labor composition	0.3%	0.2%	0.1%	-0.2%	0.1%	0.1%	0.1%	0.0%
Tangible capital deepening	0.3%	0.0%	0.2%	-0.1%	0.4%	0.2%	0.0%	-0.3%
Non-ICT tangible capital deepening	0.1%	0.0%	0.0%	0.0%	0.2%	0.2%	0.0%	-0.2%
ICT tangible capital deepening	0.2%	0.0%	0.1%	-0.1%	0.1%	0.0%	0.0%	-0.1%
Intangible capital deepening	0.4%	0.4%	0.2%	-0.2%	0.2%	0.1%	0.2%	0.0%
Technology-related intangible capital deepening	0.1%	0.1%	0.0%	-0.1%	0.0%	0.1%	0.0%	0.0%
Business innovation-related intangibles capital deepening	0.3%	0.3%	0.2%	-0.1%	0.2%	0.1%	0.1%	0.0%
Total Factor Productivity	1.0%	-0.3%	0.1%	-0.9%	0.0%	-0.9%	-0.2%	-0.2%
United States								
Labor productivity growth	2.0%	1.7%	1.0%	-1.0%	0.9%	0.5%	0.2%	-0.6%
Labor composition	0.2%	0.3%	0.1%	-0.1%	0.1%	0.2%	0.1%	-0.1%
Tangible capital deepening	0.6%	0.5%	0.2%	-0.4%	0.3%	0.3%	0.0%	-0.2%
Non-ICT tangible capital deepening	0.2%	0.2%	0.0%	-0.2%	0.2%	0.3%	0.0%	-0.1%
ICT tangible capital deepening	0.4%	0.3%	0.1%	-0.3%	0.1%	0.1%	0.0%	-0.1%
Intangible capital deepening	0.5%	0.8%	0.5%	-0.1%	0.2%	0.2%	0.2%	0.1%
Technology-related intangible capital deepening	0.4%	0.6%	0.3%	-0.1%	0.1%	0.1%	0.1%	0.0%
Business innovation-related intangibles capital deepening	0.2%	0.2%	0.2%	0.0%	0.1%	0.2%	0.2%	0.1%
Total Factor Productivity	0.6%	0.2%	0.2%	-0.4%	0.3%	-0.3%	-0.1%	-0.4%

Note: See Table 3 for taxonomy of intangible-intensive and less intangible-intensive industries. Market economy excludes public administration (NACE Sector O), education (P), health care (Q), activities of households (T) and extra-territorial organisation (U), as well as real estate (L). "Intangibles –technology-related" are measured as part of GDP and included in the national accounts; "intangibles – business-innovation related" are not included in GDP in the national accounts (see Figure 1).

Source: EUKLEMS-INTANProd, 2023 (<https://euklems-intanprod-ilee.luiss.it/>)

Differences between EUKLEMS & INTANProd – Release 2023 and Goodridge & Haskel (2023) for the UK

This note relies on source data from [EUKLEMS & INTANProd \(Release 2023\)](#) – hereafter referred to as EUKLEMS. For comparison we also looked at recent data from [Goodridge and Haskel \(2023\)](#) – hereafter referred to as GH – used to construct vintages of industry level national accounts and growth accounting data for the UK.

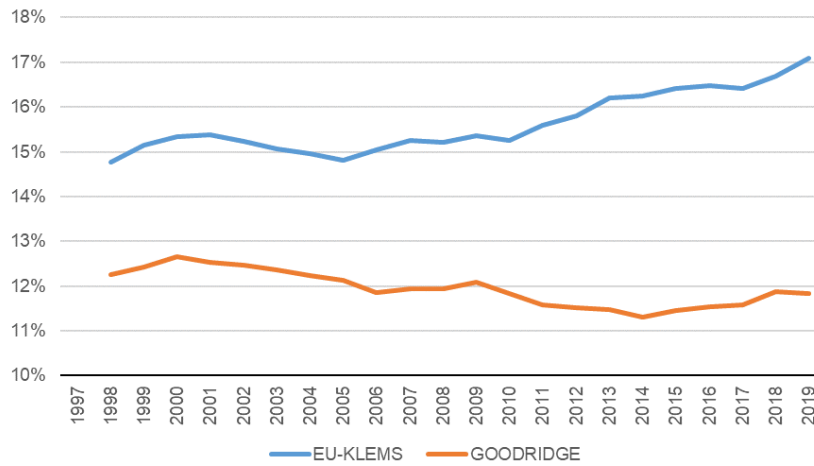
Both datasets rely on the Corrado-Hulten-Sichel framework to identify intangible assets, both use different somewhat different sources. GH relies entirely on (in part, experimental) data from the Office of National Statistics, whereas EUKLEMS is largely based on data from Eurostat (only including official ONS data) as well as slightly different computations by the KLEMS team in order to better harmonise data across countries and industries.

The aggregate level of nominal intangible investment as a share of value added is substantially higher in EUKLEMS data than in GH, and the EUKLEMS share also increased whereas it slightly declined according to GH. EUKLEMS shows particularly higher levels of intangible investment for Brand, Design, and Organizational Capital, where GH show higher levels of training investment data.

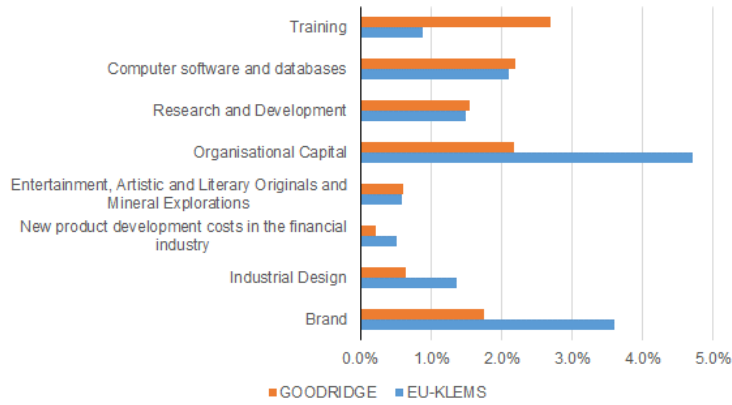
The growth rates of real investment in intangibles are also different between the two datasets. Overall real intangible investment grew on average 1.6 percent per year between 1998 and 2019 according to GH, versus a much faster 3.3 percent growth rates in the EUKLEMS dataset. The differences are largest for design, organizational capital and training where EUKLEMS shows much faster growth (in the latter case GH even shows a decline); while New Product Development costs in the financial industry show much faster growth according to GH. With regards to real intangible investment growth by industry, EUKLEMS shows faster growth in all sectors, except for C13-15 (textiles and apparel).

On balance, the weaker growth performance on intangible capital according to GH would have further reduced its contribution to UK labour productivity growth. While this may have slightly lessened the paradoxical situation of a relatively large contribution of intangible capital in the context of weakening productivity growth, the observation that intangible capital has been insufficient in supporting productivity growth during the post-GFC period is maintained.

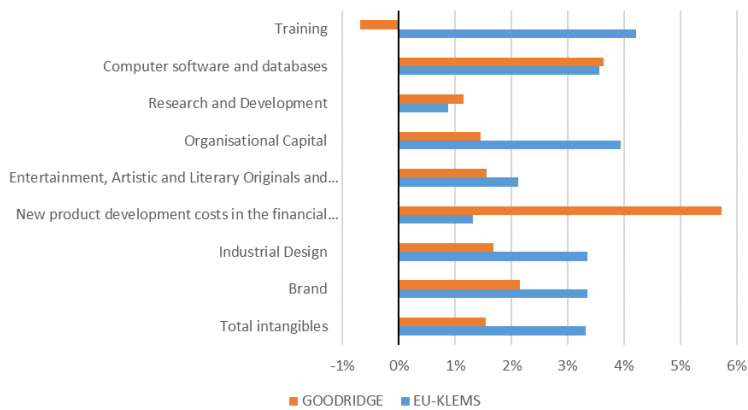
Nonfarm market sector intangible investment share



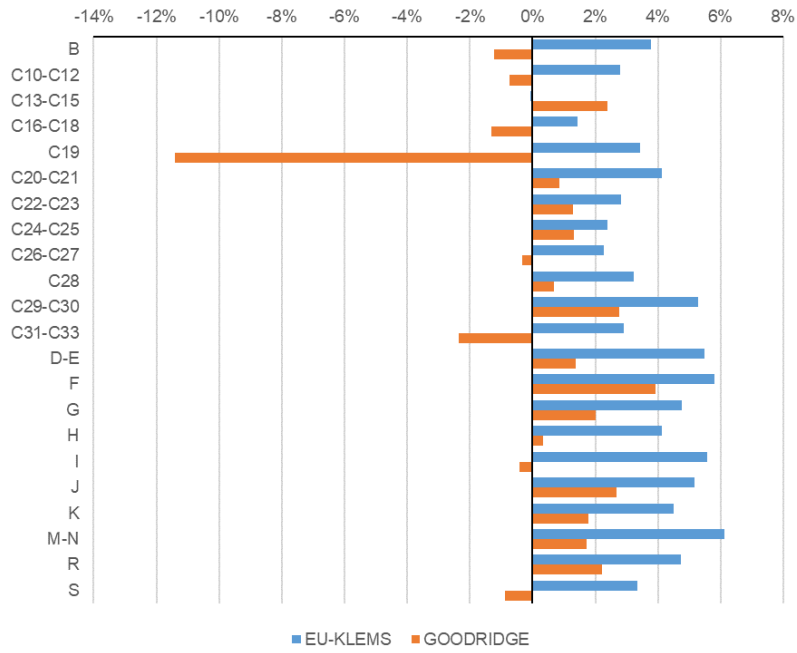
Nonfarm market sector intangible investment share, 2010



Nonfarm market sector real intangible investment growth, 1998-2019 (average annual % change)

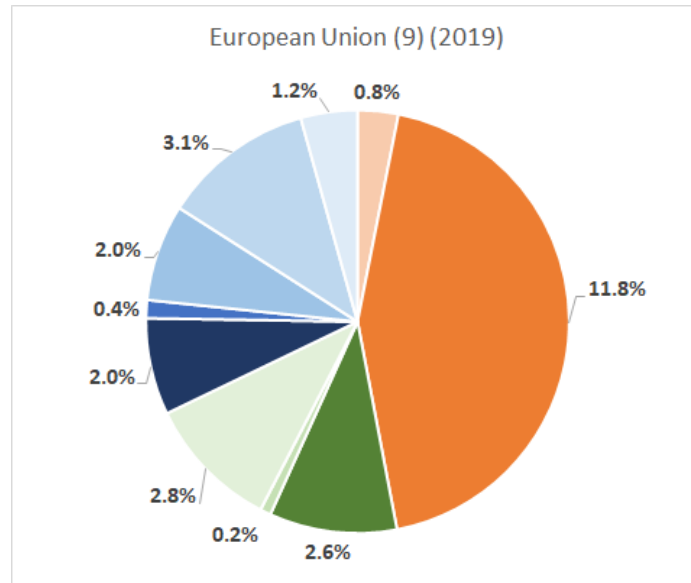


Real intangible investment growth, 1998-2019 (average annual % change)

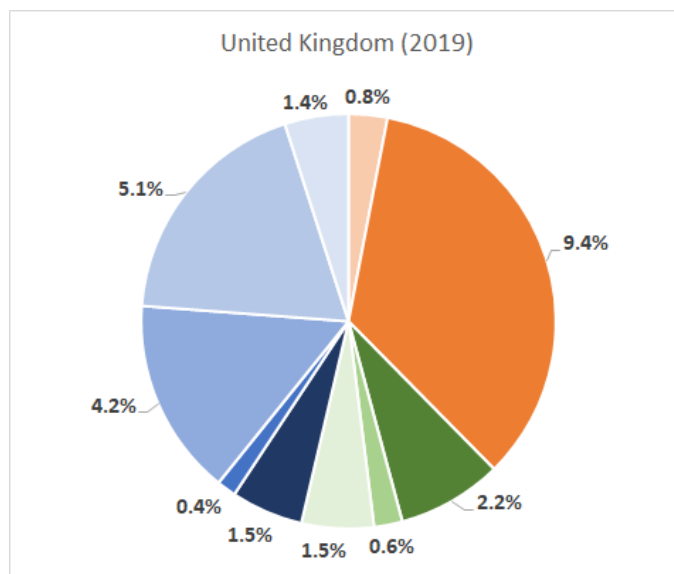


Appendix Chart 1: Nominal Investment Share in Value Added, Market Economy, 2019

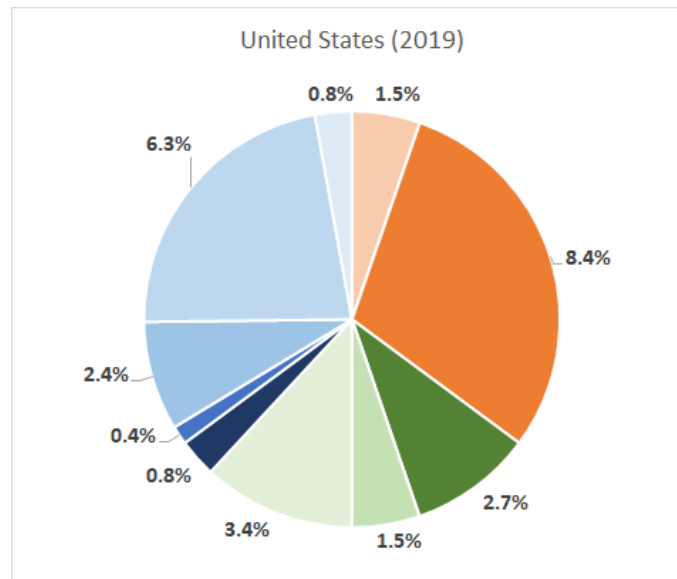
Panel A: European Union (9)



Panel B: United Kingdom



Panel C: United States



- ICT assets
 - Computer software and databases
 - Research and development
 - New product development costs in the financial industry
 - Organisational capital
- Non-ICT assets
 - Entertainment, artistic and literary originals + mineral explorations
 - Industrial design
 - Brand
 - Training

Notes: European Union (9) includes Austria, Germany, Denmark, Finland, France, Italy, Netherlands, Spain and Sweden and are weighted by their GDP. Market economy excludes public administration (NACE Sector O), education (P), health care (Q), activities of households (T) and extra-territorial organization (U), as well as real estate (L).

Source: EUKLEMS-INTANProd, 2023 (<https://euklems-intanprod-ilee.luiss.it/>).