The Future of Intangibles

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Safe and Ethical Cyberspace, digital assets and risks:
How to assess the intangible impacts of a growing phenomenon?

The World Conference on Intellectual Capital for Communities

UNESCO, June 14&15 2018

The INNODRIVE Consortium:

University of Vaasa (UNIVAASA), Finland ,
http://www.uwasa.fi/english/

Centre for European Policy Studies (CEPS), Belgium
http://www.ceps.eu/index3.php

Deutsches Institut für Wirtschafsforschung (DIW), Germany
http://www.diw.de/deutsch/

Statistics Norway (STATNO), Norway
http://www.ssb.no/english/

National Institute for Economic and Social Research (NIESR), United Kingdom
http://www.niesr.ac.uk/

Inštitut za ekonomska raziskovanja (IER), Slovenia
http://www.ier.si/

Elinkeinoelämän tutkimuslaitos, (ETLA), Finland
http://www.etla.fi/eng/index.php

NÁRODOHOSPODÁRSKÝ ÚSTAV AV CR, (EI), Czech Republic
http://www.cerge-ei.cz/default.asp

Libera Università Internazionale degli Studi Sociali Guido Carli (LUISS), Italy
http://www.luiss.it/

INNODRIVE

Intangible Capital and Innovations: Drivers of Growth and Location in the EU

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Why intangibles matter?

It is widely recognised that intellectual assets are major determinants of the generation of innovation and thus in the enhancement of growth, employment and competitiveness. However, our knowledge of the contribution of intangibles to economic performance is still incomplete.

While firms undoubtedly are at the centre of innovation and productivity growth, their activities are hard to analyse empirically. Furthermore, at the macro-level the national accounts data on capital formation focus primarily on fixed investment and have only recently attempted to measure investment in intangibles such as software, human capital, artistic creations and the value of intellectual property rights.

What is INNODRIVE?

The INNODRIVE project aims at reducing our ignorance by providing new data on intangibles and new estimates of the capacity of intangible capital to generate growth.

Functional occupational codes in Employers' wage data

Confederation of Finnish Employers Occupations 2010 codes		
112	011	TOP MANAGEMENT
1211	012	CORPORATE MANAGEMENT
1223	021	RESEARCH
"	022	DEVELOPMENT
"	023	PRODUCTION PROCESS DEVELOPMENT
	031	QUALITY CONTROL
1213,	041	IMPLEMENTATION DEVELOPMENT
132, 214-5	042	IMPLEMENTATION (valmistus ja käyttötehtävät)
216	051	CONSTRUCTION DEVELOPMENT 1-2 management, architechts
	052	CONSTRUCTION
	061	TRANSPORT (61)
133, 2153,25	071	COMPUTER
"	081	MAINTENANCE
1221, 243	091	PURCHASES
1222	101	MARKETING
121, 242	121	ADMINISTRATION
241	141	FINANCE ADMINISTRATION UPPER
	142	FINANCE ADMINISTRATION LOWER
1212	161	PERSONNEL MANAGEMENT
	9999	UNKNOWN

+ Skill level expert or above required except computer 071

+Education field codes such as engineers in services as proxy for R&D work , see Piekkola, Hannu (2016), 'Intangible Investment and Market Valuation', Review of Income and Wealth, 62 (1), 28-51, 9% of all work

ISCO08 R&D work 8% of all, with Finnish and Danish data

R&D work Technical and mathematical work professional

R&D managers 1223 (1237)

Science and Engineering Professionals 21 (excluding telecommunication engineering 2153)

Physical and earth science professionals 211 (211), Engineering Professionals 212 (212) Mathematicians, Statisticians, Life-science professionals 213 (212), 214 (212), Electrical, Electronics Engineering 2151, 2152 (212), Architects, Planner 216 (212)

Health professionals 22

Medical doctors 221 (222), Nursing and Midwifery Professionals 222 (223), Other Health Professionals 226 (223), 22 (isco3 not available)

Science and Engineering Associate Professionals 31

Physical and Engineering Science Technicians 311 (311), Life Science Technicians and Related Associate Professionals 314 (321)

OC work reclassified as R&D work if education field code is not Social Sciences and Business and isco3 in 1,12,13,23,24,34

R&D work reclassified as ICT work if Isced2011 computing and 1,12,13,23,24,34

Firm-level innovation and competitiveness

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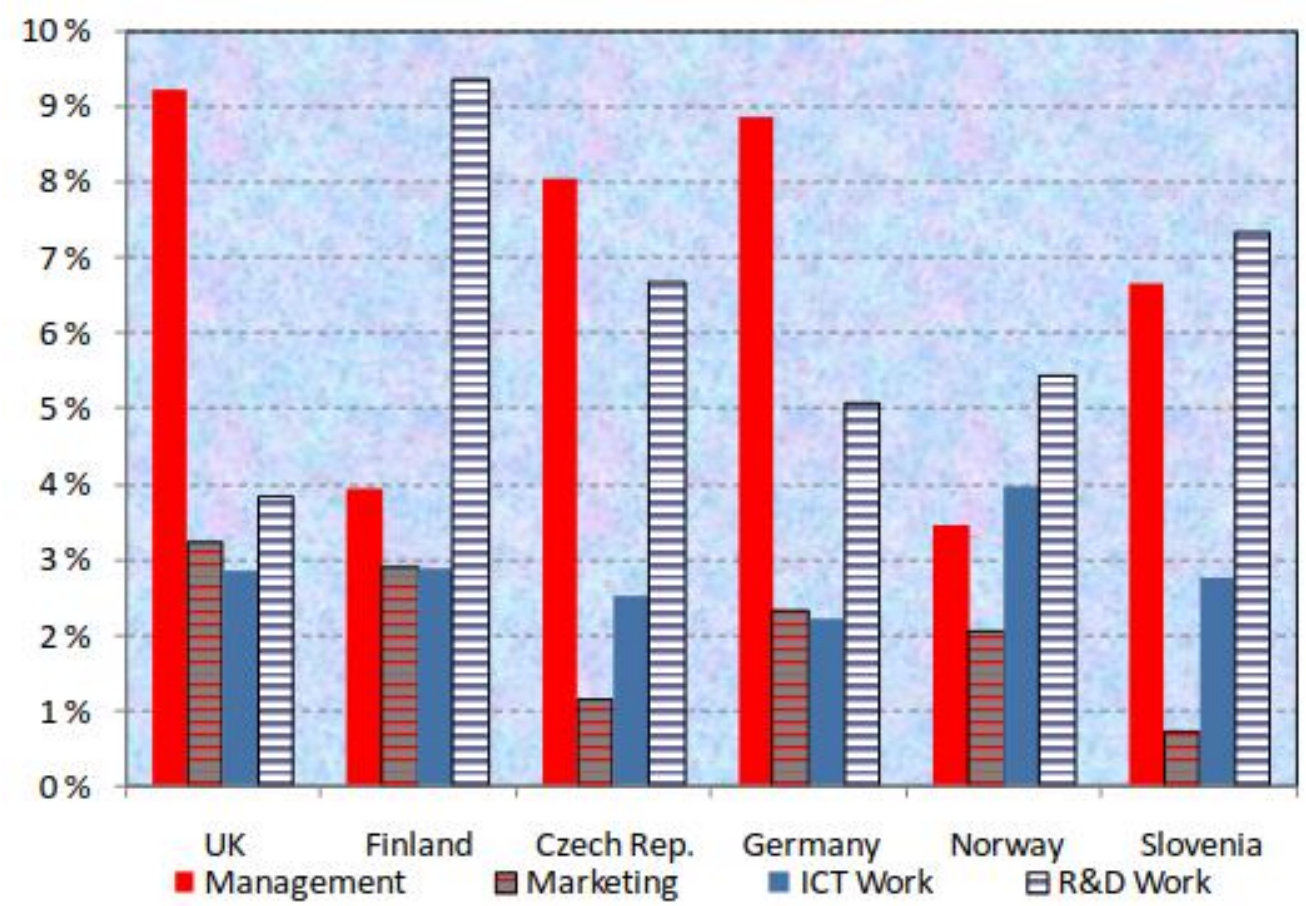
INNODRIVE 2008-2011 MICRO APPROACH

Linked employer-employee data Finland, Norway, the UK, Germany,m Czech Republic, Slovenia

Figure 1. Occupational shares of IC work



Intangibles (ICs) from labour input IC=OC, R&D, ICT,

OC: Organisational workers such as management (incl. owners) and marketing employees

R&D: personnel defined by technicians, engineers, and similar

ICT: personnel defined by information and communication experts

Table 1. Multiplier for use of intermediates and capital services for one unit of labor in intangible investment and depreciation, INNODRIVE methodology

	ICT	R&D	OC
Multiplier for IC labor costs= use of intermediates and capital services X share of investment-type IC work (0.2 in OC, 0.35 in R&D and 0.5 in ICT work)	0.70	1.1	0.35
Depreciation	0.33	0.15	0.20-25

Broad and survey ICs, Finland 1995-2013*

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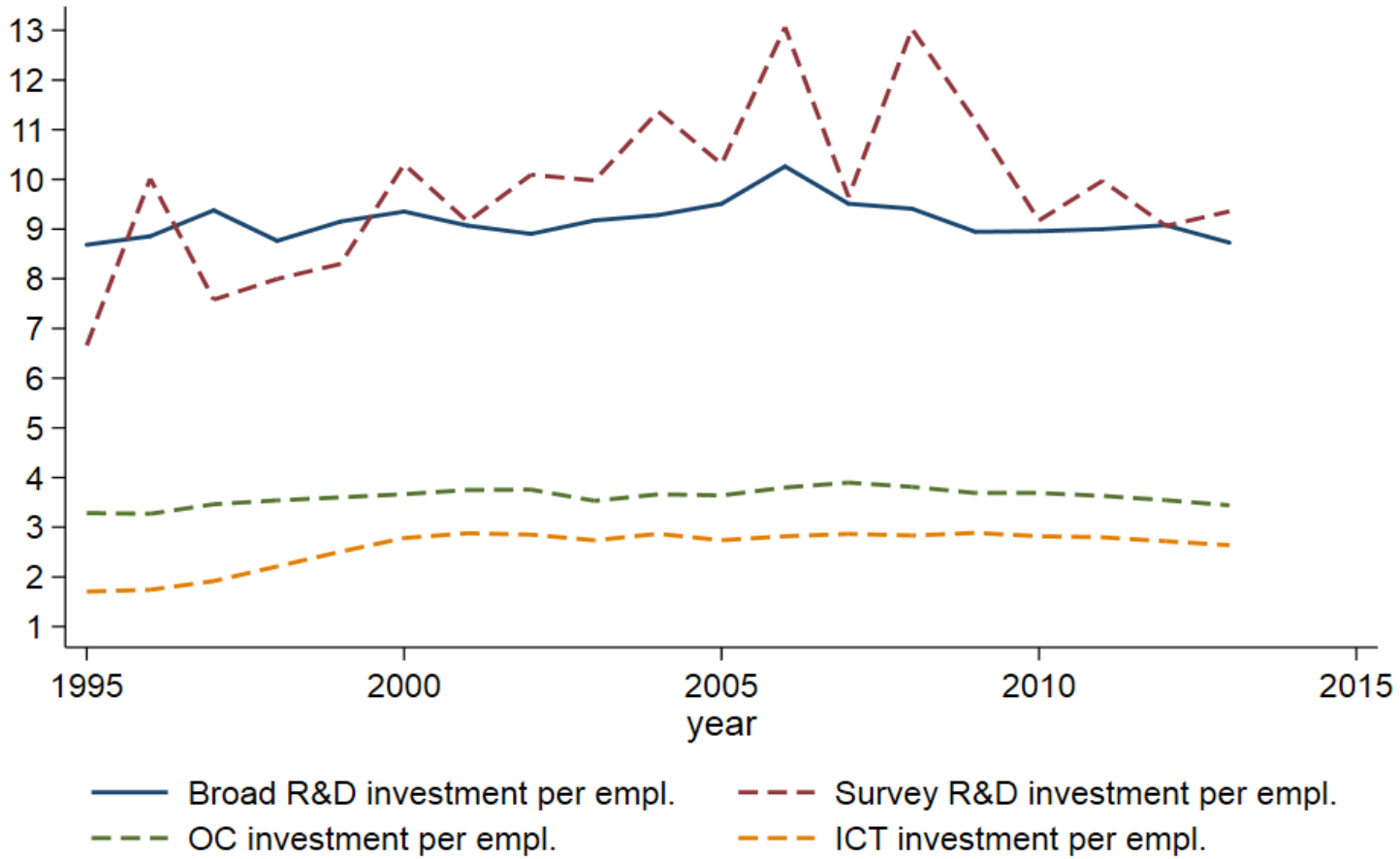
1. Statistics Finland remote access:
    1. Employee and firm data, trade data, legal form data 1995-2013
    2. R&D survey every year, survey CIS every second-year 1996-2014
        1. CIS survey 36000 obs when new process and new product innovations are asked for past two years.
2. Broad R&D, ICT, OC from register-based data, using occupations (ISCO-08) following EU FP7 Innodrive 2008-2011 methodology
    - Internal R&D, but external R&D from formal R&D (R&D survey)
    - ICT services in deployment phase: (i) general knowledge, (ii) those interacting with R&D activity (used here)
    - Organisational (OC management of marketing) in reallocation of resources (instrument for use of other IC in innovations)

*Based on “Schumpeterian growth using a broad set of intangibles to enhance innovations” presented in DRUID18, with Jaana Rahko

Figure 1. R&D, OC and ICT investment per employment in Finland 1995-2012, thousand 2010€



Note: Formal R&D is reported in 31% of the CIS survey firms, while broad R&D (occupational R&D + external formal R&D) has coverage of 85%.

Productivity using CDM-model

- A CDM model (Crépon et al. 1998) three steps:
- Step 1 Heckman method for missing survey R&D: trade variables, legal form, firm age identifying positive R&D. Results: R&D intensity depends on tangibles, OC, market share, profits (negatively), firm size and firm age
- Step 2 R&D and other controls explain probability of process and product innovations

  Probit estimation with R&D instrumented by OC, K, trade vars, legal form, sample bias correction from step 1
- Step 3 Production function and profitability estimation augmented with process and product innovations instrumented by lagged predicted process and product innovations from step 2, see Wooldridge (2010p. 937-945)

CDM-model expected results

- Process and product innovations increase productivity, Griffith et al. (2006 Oxford Review EP) 1998-2000:
  - France, not in Germany
  - Spain and UK: only product innovations
  - Italy: only in SMEs (Hall et al. 2009) 1995-2003
- Refined Schumpeterian view à la Aghion et al. (2014): U-shape pattern for competition (retained earnings) and innovations
  - Low profit corner with competitive firms producing new innovations (laggards have reached the innovation level of the leader)
  - High profit corner where a leading firm in innovations, competitors far behind.

Schumpeterian growth and broad set of intangibles (IC) main results for Finland

Organizational capital (OC), ICT and broad R&D in private sector firms in 1995-2013

- The returns of other technical innovation activities that are not formally R&D according to the Frascati definition by OECD can create a considerable share of the value added
  - Survey R&D from CIS survey deviant especially in analyzing services (70% of economy) and small firms
- Process innovations have a strong effect on productivity
- With broad R&D results extend to product innovations, SMEs and services with knowledge intensive business industries
- Traditional Schumpeterian growth requires market power for innovations to increase profits: here in general and in manufacturing: also an inverted U-shape pattern between retained earnings and innovations, new insights by Aghion et al. are different

Broad R&D preferred proxy for R&D especially for SMEs and services where surveys are not representative

- Survey R&D more sensitive to the choice of instruments (a lot of missing observations)
- Overlap of R&D and ICT avoided when based on innovative work from register-data

Organizational capital (management and marketing) allocates the resources to build up ICT and R&D.

ICT augments R&D here in process innovations

Traditional Schumpeterian framework explains market power effects

GLOBALINTO Capturing the value of intangible assets in micro data to promote the EU's growth

Proposal EU Horizon 2020 Horizon2020-SC-Transformations-14-2018 March 2018

- New measures of intangible assets at the firm level in co-operation with statistical offices
- Filling an important gap in measurement which has restricted statistical production, micro-based analysis and evidence-based policymaking.
- Analyse the various potential explanations of the productivity puzzle, both at micro and macro levels

Participant No *	Participant organisation name	Country
1 (Coordinator)	Vaasan yliopisto (University of Vaasa)	Finland
2	Aarhus Universitet (Aarhus University)	Denmark
3	Universität Hamburg (University of Hamburg)	Germany
4	Univerza V Ljubljani (University of Ljubljana	Slovenia
5	Université Paris Sud (University of Paris-Sud)	France
6	National Technical University of Athens	Greece
7	University of Manchester	The UK
8	Statistisk Sentralburaa (Statistics Norway)	Norway

Challenge and/or scope	How the challenge is addressed
Data provision and its take up in the official statistical systems in Europe	GLOBALINTO will co-operate closely with NSIs in building broader measures of ICs.
"Productivity puzzle" is key issue and will become more problematic with far-reaching demographic changes and globalization.	GLOBALINTO will fill a key gap related to broader measurement of intangible assets (in addition to R&D) at the firm level, in order to identify new sources of **capital deepening**,
Boosting economic growth requires concerted actions to simultaneously stimulate supply and demand side economic policies.	GLOBALINTO will assess the **importance of knowledge spillovers** in explaining the productivity puzzle.
Barriers for low entry and weak dynamism (finance, skills, knowledge diffusion, scaling-up) in European SMEs and start-ups.	We can fully identify and analyse the entry barriers for SMEs that are substantially different in manufacturing and services.
Understanding whether the growth stagnation of the past decade is truly "secular" or not, and analyse the kind of fiscal and monetary policy tools	Such policies include tax incentives or financial support for specific intangibles, a new accounting system where IA can be valued as collateral or business confidence improving (monetary) policies.
The role of public sector intangibles (culture, education, skills) in the growth-productivity relationship in Europe	GLOBALINTO will examine interactions of market and public sector intangibles and public institutions that are relevant in innovation policy.

Future work

- Future work with remote access to Statistical Offices data
  - Productivity analysis using register data in Finland, Denmark, Norway, Slovenia, co-operation with University of Århus, Denmark ongoing
  - Environmental and intangible capital driven innovations and productivity
- Performance-based estimates: productivity of IC work and its value added share using output elasticities from production function estimation
  - Share of innovative work in R&D, OC and ICT reassed
- Broad R&D to evaluate market value of firms
- ICs, innovations and firm performance in a dynamic framework and as part of value chains