UNLOCKING INVESTMENT IN INTANGIBLE ASSETS IN EUROPE

EUROPEAN COMMISSION

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22/06/2018, CompNet Annual Conference 2018, Halle / Saale (DE)

Motivation

Context: Work on 3rd pillar of the Investment Plan for Europe

▪ ***When looking at investments, do we need to differentiate between tangible vs. intangible assets? What are the specifics / links between asset types?***

▪ ***What are the driving forces / bottlenecks to investments?***

▪ ***Need for policy action with regard to intangibles?***

Some need for clarification…

- What are intangible assets? → conceptual issues / definitions…
- What about trend patterns / order of magnitude? → data issues…
- What is the role of intangibles for the economy? Why should we care?

Structure of the presentation

I.   What are intangible assets?

II. What makes intangibles special?

III. Order of magnitude and trend patterns: stylized facts

IV. Empirical analyses

      V.1   Growth accounting including intangible assets
      V.2   Intangibles and TFP growth
      V.3   Drivers and barriers to investment

V.   Conclusions: findings and policy messages

I. What are intangible assets?

Broad category of intangible assets	Type of intangible assets included	captured in SNA (ESA 2010)
COMPUTERIZED INFORMATION	▪ Software	✓
	▪ Databases	✓
INNOVATIVE PROPERTY	▪ (scientific) R&D	✓
	▪ Mineral exploration	✓
	▪ Copyright and creative assets	✓
	▪ New product development in financial services	-
	▪ New architectural and engineering designs	-
ECONOMIC COMPETENCIES	▪ Brand-building equity / advertisement	-
	▪ Market research	-
	▪ Training of staff	-
	▪ Management consulting	-
	▪ Own organizational investment	-

Source: Corrado, Hulten and Sichel, 2005.

Note: Defining the asset boundary (i.e. in/ex-excluding the spending on certain intangibles) has implications for measuring value added, productivity and economic growth!

II. What makes intangibles special?

Defining characteristics of intangibles

no physical embodiment, but that is not all…

- **Competition-related characteristics**
  - limited appropriability, only partial excludability
  - limited separability and transferability (pre-con for use as collateral)
  - non-rivalry (can be deployed simultaneously by multiple users)

- **Risk, sunk costs, and uncertainty**
  - low ex-ante verifiability
 - exploring new fields (incl. failures) and large upfront investment requirements

- **Synergies & complementarities among asset types**
  - investment only (fully) productive if complementary asset exists, i.e. factors hindering investments in one asset type may work as barrier for the entire project

Note: intangible assets are also highly 'mobile'. For instance, Irish GDP rose by 26% in 2015 due to relocation of intangibles for tax reasons (without additional value creation in Ireland). ESTAT is working on addressing the issue…

III. Taking a closer look at investments in intangible assets:
some stylized facts…

Intangibles drive market value of companies, but ...
value of intangibles not accounted for/explicitly reported

R^2s of market values regressed on earnings and book values of companies entering the public market in successive decades, 1950–2013

Source: (Lev and Gu, 2016) Figure 82, p.88
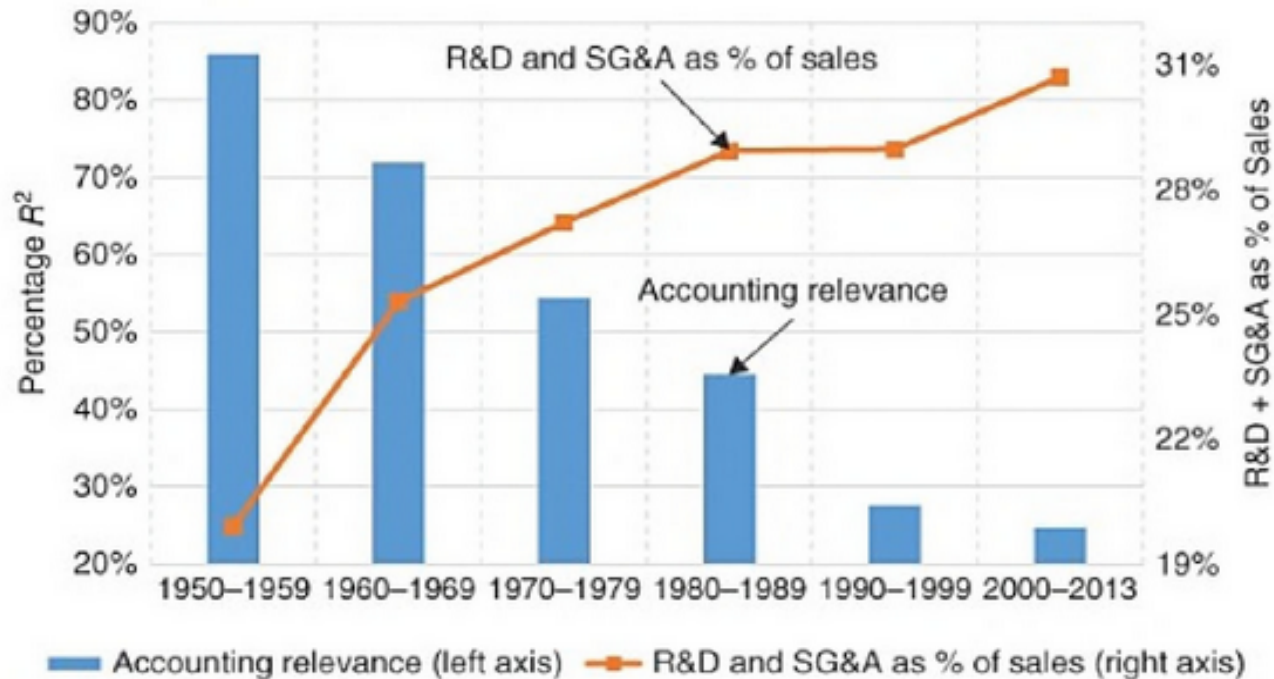
Example

FACEBOOK, IPO 2012, Annual report 2015 <link>

1.6bn users monthly
Market Cap: 371.5bn$
Total assets: 49.4bn$
Intangible assets: 3.2bn$

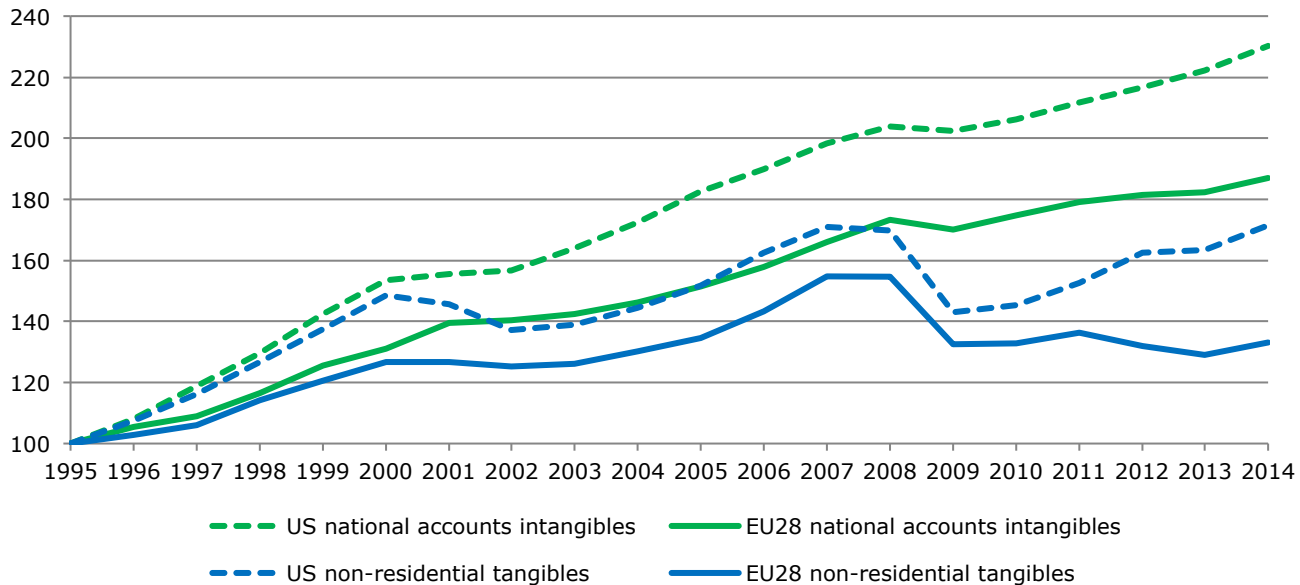Value of data not captured in the company reporting

Investment in intangibles is growing steadily
Shift towards the knowledge economy?

Total economy according to SNA:
Non-residential intangible and tangible investments in EU-28 vs. U.S.

chain linked volumes, index 1995 = 100

Legend:
- - - - US national accounts intangibles
——— EU28 national accounts intangibles
- - - - US non-residential tangibles
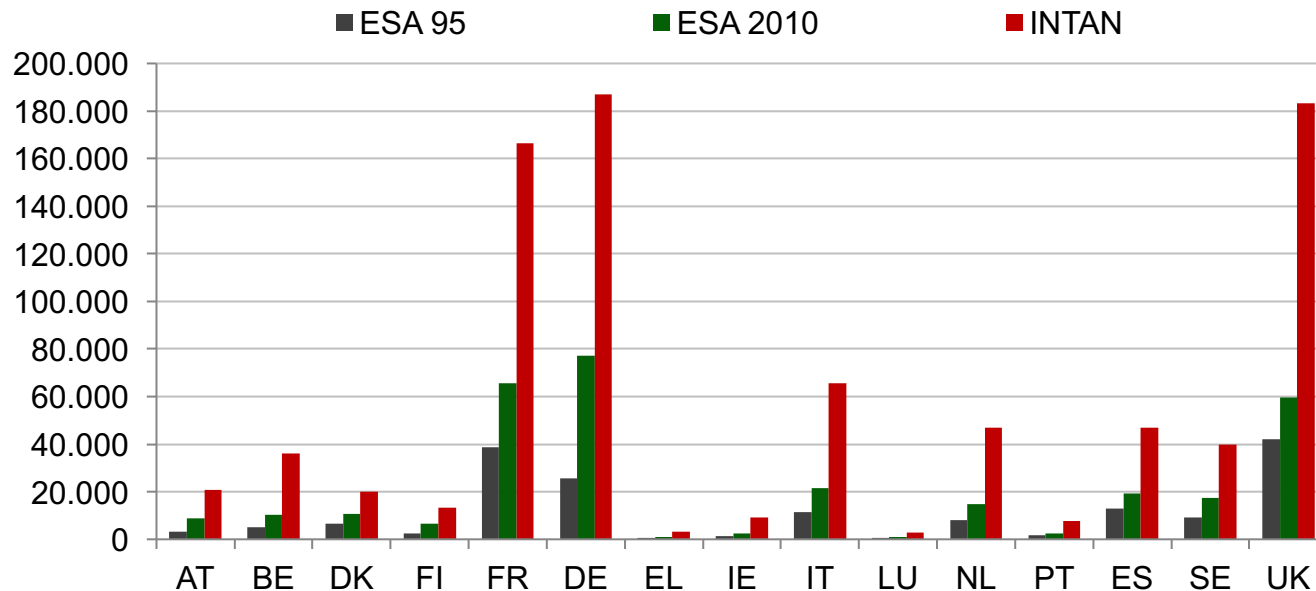——— EU28 non-residential tangibles

Sources: Eurostat national accounts for EU-28, BEA for U.S.

Order of magnitude

▪ *NA intangibles (as in ESTAT) account only for ca. 50% of all intangible assets*

Investment in business sector intangible assets in EU-15 [2013, million Euros], according to different accounting standards

Note: Business sector defined as NACE Rev. 2 activities A to N (excluding L) plus R and S. Investments according to ESA 95 were obtained from ESA 2010 (NA-intangibles) diminished by investment in R&D.

For data and underlying methods see the INTAN-Invest database (FP7 project): http://www.intan-invest.net/

Source: INTAN-invest data (intangible GFCF; 'national account intangibles', 'new-intangibles').

Trend patterns (1) - general

- **_Difference in the trends_** of investments in tangible vs. intangible assets
- **_Intangibles_** appear to be significantly **_less affected by the economic crisis_**
- **_EU lagging behind the US_**

Business sector non-residential investment (GFCF) by asset type, EU-15 vs. US
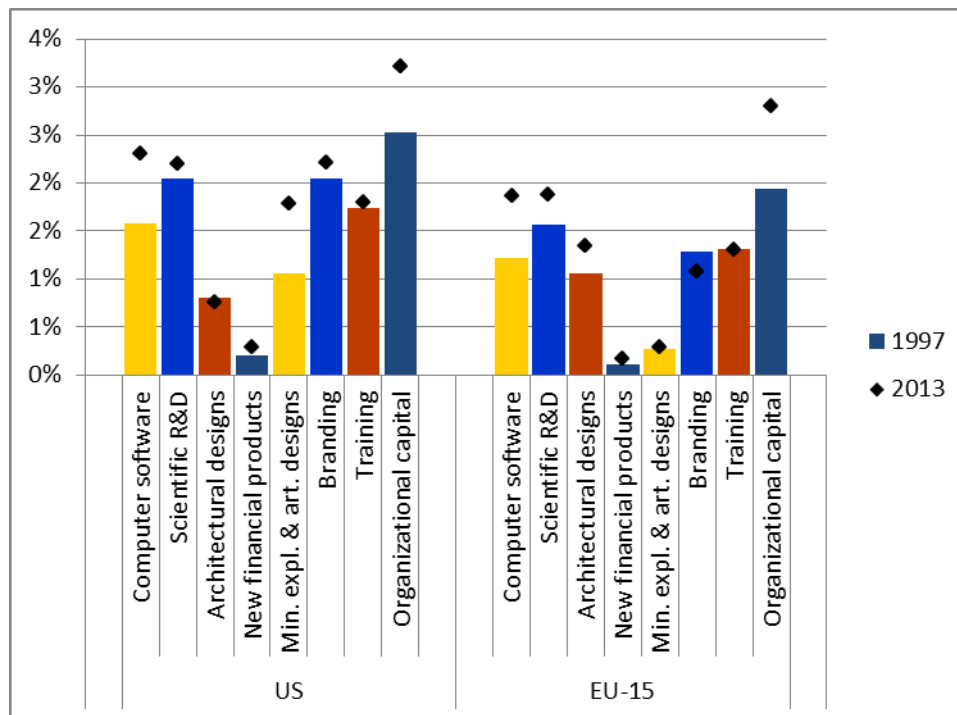(% of business sector GVA)
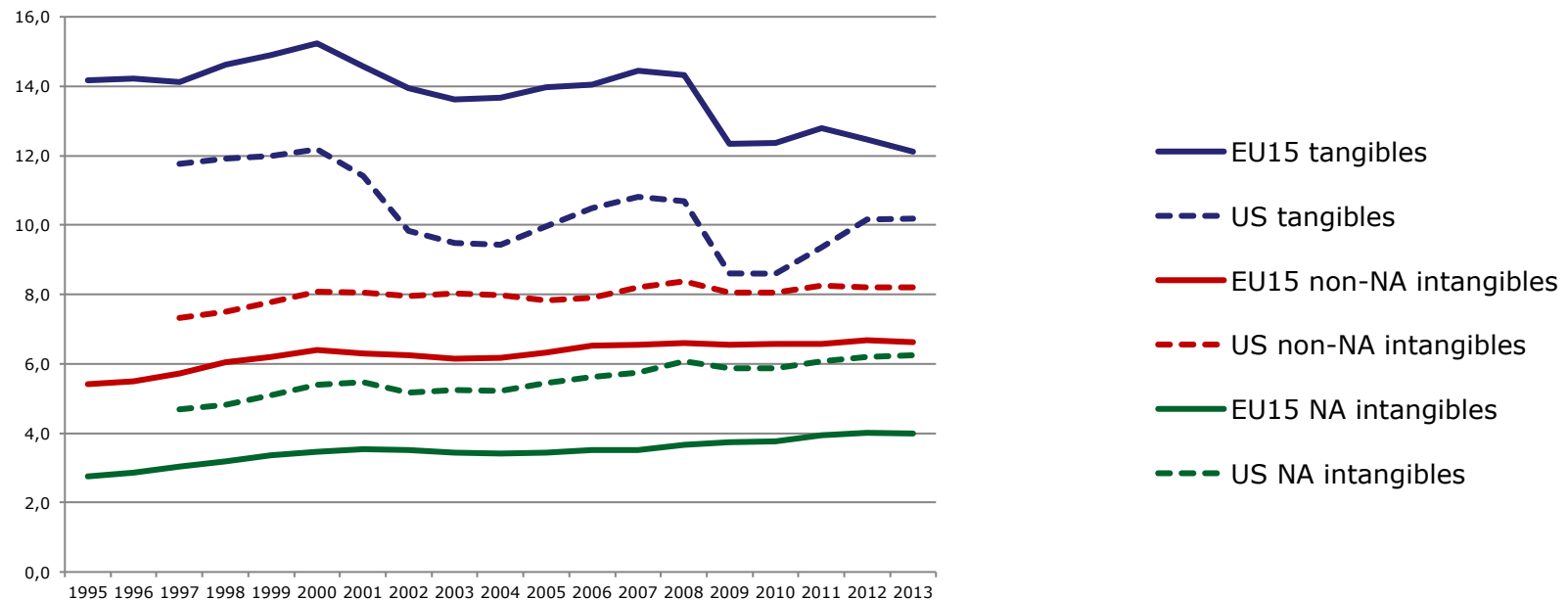
Note: Business sector defined as NACE Rev. 2 activities A to N (excluding L) plus R and S.
Source: Own calculations based on INTAN-invest data and Eurostat/BEA national accounts data (business sector GVA).

Trend patterns (2) – per asset type

Investment in intangible assets as % of GVA in the US and EU-15, per asset type [1997, 2013]

- Increase in the EU15 GVA-shares for almost all intangible asset types

- Reducing the intensity gap between EU and US (e.g. R&D, org. capital)

- EU ahead of the US (esp. in architectural designs)

- No catching up in terms of investment in software, branding, training, min. explorations

Source: Own calculations based on INTAN-invest and Eurostat/BEA national accounts data (business sector GVA)

IV. Empirical Analyses

1) *Do intangibles contribute to economic growth?*
   → Growth accounting controlling for intangibles

2) *Are intangibles linked with productivity?*
   → Regression analysis of intangibles and TFP growth

3) *How can we unlock investment in intangibles?*
   → Investment regressions to test the role of drivers and barriers to investment in intangibles

(1) Growth accounting

Methodology:
$$g_t^Y = s_t^C g_t^C + s_t^I g_t^I = s_t^K g_t^K + s_t^L g_t^L + g_t^A$$

with g_t^X denoting growth rates, Y (gross value added), C (consumption), I (investment), K (capital), L (labour) and A (TFP) in time t; s_t^K and s_t^L equal the respective income shares $s_t^K = \frac{P_t^K K_t}{Y_t}$, $s_t^L = \frac{P_t^L L_t}{Y_t}$

Conceptually three GA's (Corrado et al. 2005 and Corrado et al 2017 EIB discussion paper): Contributions of supply-side components to GVA growth [1995 – 2013; annualized; National Accounts and FP7 financed INTAN-INVEST data]

GA(3)	$g_t^A = g_t^Y - s_t^K g_t^K - s_t^L g_t^L$	only tangible capital considered
GA(2)	$g_t^{A^*} = g_t^{Y^*} - s_t^K g_t^K - s_t^L g_t^L - s_t^R g_t^R$	R denoting NA-intangible capital
GA(1)	$g_t^{A^{**}} = g_t^{Y^{**}} - s_t^K g_t^K - s_t^L g_t^L - s_t^R g_t^R - s_t^{R'} g_t^{R'}$	R' denoting non-NA intangible capital

Remarks:

- Main assumptions: (A1) production process can be represented by a Cobb-Douglas production function and (A2) perfect competition i.e. factor elasticities are equal to factor shares

- GVA adjusted according to inclusions of intangible capital. Income shares were computed: for labour as compensation per employee over GVA, for capital as capital services (simplified Jorgensonian user cost, i.e. depreciation rates + AMECO long-term real interest rates) over GVA

(1) Growth accounting

		GVA Growth	Labour Composition	Multifactor Productivity	Capital Composition	Contribution to capital composition		
						Tangible assets	NA-Intangibles	Non-NA Intangibles
		(1)	(2)	(3)	(4)	(4a)	(4b)	4(c)
AT	(1) INTAN	2.123	0.144	0.975	1.004	0.515	0.217	0.272
	(2) NA-IPP	2.110	0.151	1.151	0.809	0.581	0.227	:
	(3) NA-TAN	1.929	0.157	1.165	0.607	0.607	:	:
BE#^	(1) INTAN	2.185	0.142	1.068	0.975	0.281	0.135	0.560
	(2) NA-IPP	1.971	0.154	1.347	0.470	0.324	0.147	:
	(3) NA-TAN	2.141	0.160	1.642	0.339	0.339	:	:
DE	(1) INTAN	1.345	-0.099	0.427	1.018	0.532	0.276	0.210
	(2) NA-IPP	1.295	-0.105	0.496	0.904	0.612	0.291	:
	(3) NA-TAN	1.225	-0.110	0.682	0.654	0.654	:	:
DK	(1) INTAN	1.415	0.051	0.926	0.438	-0.082	0.247	0.273
	(2) NA-IPP	1.385	0.055	1.162	0.168	-0.095	0.263	:
	(3) NA-TAN	1.159	0.058	1.204	-0.102	-0.102	:	:
EL^	(1) INTAN	0.224	-0.258	-1.417	1.898	1.712	0.044	0.142
	(2) NA-IPP	0.232	-0.263	-1.325	1.820	1.774	0.045	:
	(3) NA-TAN	0.863	-0.265	-0.668	1.796	1.796	:	:
ES	(1) INTAN	1.758	0.543	-0.713	1.927	1.436	0.191	0.300
	(2) NA-IPP	1.637	0.553	-0.696	1.780	1.585	0.195	:
	(3) NA-TAN	1.520	0.568	-0.666	1.619	1.619	:	:
FI	(1) INTAN	2.749	0.290	1.889	0.570	-0.039	0.246	0.363
	(2) NA-IPP	2.720	0.304	2.202	0.214	-0.044	0.258	:
	(3) NA-TAN	2.719	0.328	2.438	-0.047	-0.047	:	:
FR	(1) INTAN	1.995	0.147	0.933	0.916	0.329	0.133	0.454
	(2) NA-IPP	1.899	0.155	1.190	0.555	0.415	0.140	:
	(3) NA-TAN	1.796	0.166	1.185	0.444	0.444	:	:
IE~^	(1) INTAN	4.103	0.174	0.552	3.377	1.470	1.448	0.458
	(2) NA-IPP	4.336	0.179	0.973	3.185	1.701	1.484	:
	(3) NA-TAN	4.136	0.182	0.812	3.142	3.142	:	:
IT	(1) INTAN	0.487	0.028	-0.827	1.286	0.999	0.078	0.210
	(2) NA-IPP	0.515	0.029	-0.687	1.174	1.093	0.081	:
	(3) NA-TAN	0.478	0.030	-0.674	1.122	1.122	:	:
NL	(1) INTAN	2.154	0.267	0.462	1.424	0.708	0.277	0.439
	(2) NA-IPP	2.083	0.284	0.681	1.119	0.824	0.295	:
	(3) NA-TAN	2.019	0.297	0.861	0.861	0.861	:	:
SE	(1) INTAN	3.273	0.260	1.098	1.915	0.941	0.415	0.559
	(2) NA-IPP	3.164	0.274	1.305	1.585	1.148	0.437	:
	(3) NA-TAN	3.197	0.303	1.585	1.309	1.309	:	:
UK*^	(1) INTAN	2.008	0.161	1.478	0.370	-0.208	-0.017	0.594
	(2) NA-IPP	1.875	0.166	2.010	-0.300	-0.283	-0.017	:
	(3) NA-TAN	3.085	0.208	3.086	-0.209	-0.209	:	:
US	(1) INTAN	2.034	-0.041	0.604	1.471	0.685	0.193	0.593
	(2) NA-IPP	1.922	-0.045	0.969	0.997	0.786	0.211	:
	(3) NA-TAN	1.789	-0.047	1.012	0.825	0.825	:	:

(1) Growth accounting

Main findings:

Including intangibles in source-of-growth framework changes growth patterns…

- **GVA tends to grow more rapidly** (0.1 percent annual GVA growth)

- **Capital deepening becomes dominant source of growth, while intangible capital deepening accounts for about 30% of GVA growth** across the observed EU countries

- **TFP variance diminishes when including intangibles,** i.e. looking at intangibles improves our understanding of TFP differentials

- Country differences / specifics:
  - In BE, DK, FI, FR, IE, NL, SE, UK: intangible capital contributes more than tangible
  - Negative contributions of MFP found for EL, ES, IT

(2) Intangibles and TFP growth

Methodology:

Error-correction model (ECM) similar to de la Fuente & Domenech, 2002; Nicoletti & Scarpetta, 2003)

Note: data implies convergence in growth rates rather than levels; therefore model in differences:

$$\Delta^2(TFP^{TR})_{it} = \beta_{0i}[\Delta(TFP^{TR}_{it-1}) - \Delta(TFP^{TR}_{Lt-1}) - \beta_2(S_{it-1} - S_{Lt-1}) - \alpha_i] + \beta_{1i}\Delta^2 gr(TFP^{TR})_{Lt} + \varepsilon_{it}$$

- $\Delta^2(TFP^{TR})_{it}$ *- acceleration in TFP growth*
- $\Delta(TFP^{TR})_{it} - \Delta(TFP^{TR})_{Lt}$ *- difference in TFP growth*
- β_{0i} *- convergence speed*
- $\beta_{1i}\Delta^2 gr(TFP^{TR})_{Lt}$ *- spill-over from the frontier country*
- $(S_{it-1} - S_{Lt-1})$ *- gap in investment in intangibles and controls*
- α_i *- country fixed effects*
- ε_{it} *- error term*

Estimation by Pool Mean Group Estimator (PMG): good choice for non-stationary panels; allows for heterogeneity in the short-run and convergence coefficients (Pesaran et al. (1999, 2004) see also the remarks made in the distributed note)

(2) Intangibles and TFP Growth

	baseline	all intangible investment	splitting the asset types
TFP growth gap	-0.0336*	-0.0935***	-0.0840**
	(0.0194)	(0.0274)	(0.0378)
Spill-over US (differenced TFP growth US)	0.836**	1.137***	0.940**
	(0.385)	(0.427)	(0.375)
Intangible investment gap US - "All"		0.0455***	
		(0.00512)	
Intangible investment gap US - "non-NA"			0.0155**
			(0.00637)
Intangible investment gap US - "NA"			0.0370***
			(0.00380)
Constant	-0.000132	0.00146	0.000677
	(0.000234)	(0.000933)	(0.00120)
Countries	EU-15	EU-15	EU-15
Years	33	33	33

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Findings:

- *Investments in intangibles matter: Both NA- and non-NA intangibles are relevant*

- *Significantly positive relationship between investments in intangibles and TFP growth*

- *Weak convergence towards the US in trend TFP levels. However, some convergence in terms of trend TFP growth rates*

(3) Drivers and barriers to investment

We derived the following set of drivers and barriers from discussing the specific economic characteristics of intangibles : **(i) competition-related characteristics, (ii) risk and uncertainty, (iii) synergies and complementarities**

1) **Regulatory framework conditions** *(flexible markets): PMR, EPL, Doing Business Indicators [as intangibles are characterised by higher uncertainty and competition-related characteristics may lead to underinvestment]*

2) **Financial conditions**: *interest rates, debt-to-equity ratios,… [as intangibles are characterised by higher uncertainty]*

3) **Availability of human capital**: *high skilled, skill mismatch indicators,.. [as intangibles are likely to have synergies with other forms of capital in particular human capital]*

4) **Direct public intervention**: *R&D spending, private-public co-publications, … [competition related characteristics may lead to market failures]*

5) **Macro-economic conditions:** *proxied by accelerator term [as intangibles are characterised by higher uncertainty, the macro-economic environment may have a special impact]*

(3) Drivers and barriers to investment

Methodology

- Accelerator model; panel fixed effects regressions; data www.INTAN-Invest.net

- Starting from an investment equation
  $(K_{it}^* - denoting\ the\ desired\ Cap\ stock, j - times\ lags,\ \delta - depreciation)$

$$I_t = \sum_{j=0}^{J} \omega_j \Delta K_{t-j}^* + \delta K_{t-1}$$

- and the accelerator model: $\qquad\qquad \Delta K_t^* = c \Delta Y_t$

- an econometric model is derived: $\dfrac{I_{it}}{K_{it-1}} = \gamma_i + \sum_{j=1}^{N} \beta_{1j} \dfrac{\Delta GVA_{t-j}}{K_{it-1}} + \beta_2 DRI_{it-1} + \varepsilon_{it}$

Notes: $\dfrac{\Delta GVA_{t-j}}{K_{it-1}}$ - _accelerator term_; DRI_{it-1} _determinants (driver) of intangible investment_; γ_i _fixed effects_

GVA lagged to somewhat correct for endogeneity problems. The model is estimated using a FE panel estimator with standard errors corrected for autocorrelation, heteroscedasticity and intra-group correlation , based on annual data for the EU-15 (1995 – 2013).

(3) Drivers and barriers to investment

	(1) Total intangibles	(2) NA-intangibles	(3) Non-NA intangibles	(4) Tangibles
Accelerator term	0.121***	0.0771***	0.0444***	0.336***
	(0.0287)	(0.0195)	(0.0125)	(0.0402)
Tertiary education	0.0744***	0.0363**	0.0381***	0.0238
	(0.0200)	(0.0152)	(0.00874)	(0.000415)
Long-term interest rate	-0.0667**	-0.0502**	-0.0165*	-0.200***
	(0.0274)	(0.0214)	(0.00810)	(0.0240)
EPL	-0.643***	-0.0292	-0.613***	0.203
(strictness of collective dismissals)	(0.160)	(0.231)	(0.165)	(0.214)
Constant	5.388***	2.422**	2.966***	7.878***
	(0.587)	(0.796)	(0.563)	(0.552)
Country dummies	yes	yes	yes	yes
Time trend	insignificant	insignificant	insignificant	yes
Crisis control	yes	yes	yes	yes
Observations	194	194	194	194
R-squared	0.487	0.362	0.512	0.696
Number of countries	13	13	13	13

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Notes: Explanatory variables are added in lag-form as described in the main text. All variables are expressed in percentages except EPL, which is expressed on a scale of 0-6. NA-intangibles refer to those intangible asset types that are included in the national accounts' measure of Gross Fixed Capital Formation (GFCF), namely computerised information and some categories of innovative properties (e.g. mineral exploration, R&D and intellectual property rights). Non-NA intangibles refer to those intangible asset types that are captured as expenditure or intermediate consumption in the national accounts. We include country dummies (fixed effects) as well as a control for the economic crisis in 2009 (specified as a crisis dummy and an interaction term between the year dummy and the accelerator term). An additional time trend turns out to be insiginificant for most assets except for tangible assets. We include the time trend in the regression when it is significant.

Findings:

- *All sets of drivers / barriers found to be relevant for intangibles*

- *Differences in barriers / drivers of investments between tangible and intangible assets*

- *> Human capital and regulation matter more for intangibles; financial (cyclical) conditions more for tangibles*

- *> Accelerator model holds more strongly for tangible capital*

- *Some evidence for complementarities...*

V. What can we conclude from our analysis and which policy messages can be drawn?

Empirical findings

- *Investment in intangible assets tend to be underestimated.* SNA captures only about 50% of the total investment in intangibles and also corporate financial reports provide only limited information => consequences for productivity and growth estimates!

- *Investment in industrialized countries tends to shift towards more intangible / knowledge-based capital* as comparably high growth rates of investment in intangible assets show. However, the EU is lagging behind the US.

- *Trends in investment in intangible assets have been rather stable even during the recent crisis* which may imply that the knowledge economy is a strong driver for investment in intangibles.

- *Intangibles are crucial for economic growth and productivity.* In the EU-15, the contribution of total intangible assets to output growth is between one and three times as high as the contribution from tangible assets. Moreover, investment in intangible is positively associated with TFP growth.

- *Tangible and intangible assets appear to be affected differently by some key drivers and barriers*: human capital, public investments in R&D and higher education and regulation matter more for intangible assets, while financial conditions tend to have a stronger effect on tangible investment.

Policy messages

- *An enlarged understanding of knowledge creation and improved measurement is needed* (thus going beyond just R&D)

- *Characteristics of intangibles are increasingly relevant for competition policies:* non-rivalry, positive network externalities, limited appropriability, limited seperability of intangibles may distort competition

- *The regulatory framework plays an important role and a balance is needed between promoting flexible markets and effective IPR systems:* as our analysis of characteristics of intangibles show, flexible allocation of resources is pivotal for intangibles but IPR protection is needed to ensure sufficient rents that cover sunk costs in terms of knowledge-based capital.

- *Access to finance is essential:* amend financing schemes to facilitate investments esp. in intangibles (e.g. EFSI, venture capital, crowd-funding); improve systematic reporting of investment in intangibles so that they can be used as collateral

- *Direct public intervention can stimulate investing in intangibles, but careful policy design is needed to avoid crowding-out* (e.g. R&D tax credits, patent boxes, etc.)

European Commission

ISSN 2443-8022 (online)

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DISCUSSION PAPER 047 | MAY 2017

EUROPEAN ECONOMY

Economic and
Financial Affairs

HOW TO ENCOURAGE INVESTMENT IN INTANGIBLE ASSETS

- Good, efficient **product, labour and capital markets**
- Modern and effective **intellectual property rights** regime
- Effective **competition** policy
- Improved access to early-stage **financing**
- Better **accounting** of intangible investments in company accounts and economic statistics
- Good **education** and training systems with a strong science base

Intangible assets such as research, software and other intellectual property are increasingly important for determining long-term economic growth prospects.

New: ECFIN Discussion Paper 047 / 2017: *Unlocking investment in intangible assets*
ISBN 978-92-79-64885-4 (online) ISBN 978-92-79-64886-1 (print)
doi:10.2765/71516 (online) doi:10.2765/960357 (print)