Intangibles: medición y contribución al crecimiento

Experiencia internacional

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Crecimiento, empleo y la heterogeneidad sectorial en América Latina

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Motivation

Robert Solow (1987) statement about computers can be rephrased as: “While knowledge economy is all around us, it is still hard to see it in the official statistics”. Since Solow’s remark, important efforts have been made to capture the knowledge economy in the (official) statistics.

Milestones:

- The new way of Measuring Capital, and thus Productivity, taking into account the distinction among types of assets (OECD Manuals 2001a, 2001b, 2009)
  - Relevant projects: EU/LA/WORLD KLEMS; Productivity Database (OECD)
- The recognition by SNA of Software, Databases and a few more intangibles assets in National Accounts.
- The distinction between ICT and non-ICT assets of ICT producing sectors
- Corrado, Hulten & Sichel’s (2005, 2009) proposal to expand NA boundaries to include a selected group of intangible assets
  - Relevant projects: COINVEST, INNODRIVE, INTAN-Invest, KBC (OECD), SPINTAN

Corrado, Hulten & Sichel's proposal

They cut through the conceptual problem of defining intangible assets by referring to a standard inter-temporal framework that leads to the conclusion that "any use of resources that reduces current consumption in order to increase it in the future […] qualifies as investment".

Then, all types of capital should be treated symmetrically, for example, "investment in knowledge capital should be placed on the same footing as that of investment in plants and equipment".

A convenient consequence of the CHS approach and their emphasis on the symmetric treatment of all assets is that one does not have to worry too much about defining "intangibles" by way of specific characteristics. It is more important to reason in terms of capital goods and to check whether spending activity meets the test of being an outlay now to enhance future consumption.

Classification of Intangible assets

Intangible capital asset types
Computerized information
1. Software
2. Databases
Innovative property
3. Mineral exploration
4. R&D (scientific)
5. Entertainment and artistic originals
6. New products/systems in financial services
7. Design and other new products/systems
Economic competencies
8. Brand equity
a. Advertising
b. Market research
9. Firm-specific resources
a. Employer-provided training
b. Organizational structure

The major challenges in capitalizing intangibles

- Intangibles are largely invisible and hard to count:
  - Companies often do not have exact metrics to separate expenditure on intangibles assets from other expenses.
- Intangible investments are often produced within the company and therefore do not represent a market transaction:
  - However, an increasingly large share of intangibles are traded in through allowing to impute prices for within-company production and transactions.
- Intangibles are often not a direct or continuous input to current production:
  - Greater emphasis on product innovations represents a shift away from Solow into a Schumpeterian approach to growth.
- Intangibles are largely non-rival and their benefits often are not appropriable:
  - While violating marginalist principles at micro-level, the principles are close enough to the real world of a of market economy.

Consequences

The main consequences of including (some) intangibles as investment, instead of following the NA practice of treating them as intermediate consumption goods, are:

1. Gross Value Added (GVA) will increase by the same amount that the (new) intangible investment.
2. Thus, the *level* of labour productivity will also increase.
3. The real growth rate of GVA when intangibles are included can either increase, decrease, or stay (more or less) constant with respect to the GVA conventionally measured.
4. Growth accounting results can vary. The inclusion of intangibles assets in investment will most probably change the contribution of TFP growth.

Measuring Intangibles

Seminal work: Corrado, Hulten & Sichel (2005, 2009): USA.

Extensions following CHS approach:

- Comparative perspective: Innodrive, Coinvest, INTAN-Invest, KBC (OECD), & TCB

- Individual countries:

Australia: Barnes & McClure (2009) and Barnes (2010)
Canada: Baldwin, Gu & Mcdonald (2011)
Finland: Julava, Aulin-Ahmavaara & Alanen (2007)
Japan: Fukao et al. (2009)
Netherlands: van Rooijen-Horsten, van den Bergen & Tanriseven (2008)
Sweden: Edquist (2011)
UK: Marrano, Haskel & Wallis (2009)
Spain: Mas & Quesada (2013)
China: Hulten & Hao (2012)
India: Hulten, Hao & Jaeger (2012)
Brazil: World Bank (Dutz 2012)

Comparative perspective

1. INNODRIVE (*Intangible capital and Innovations: Driver of Growth and Location in the EU;* www.innodrive.org)
   - Project coordinator: Hannu Piekkola, University of Vaasa, Finland
   - Countries: EU-27 + Norway, but detailed information only for Finland, Norway, UK, Germany, Czech Republic & Slovenia.
   - Period: 1995-2005
   - Private sector of the economy. No sectoral dissagregation
   - Funded by the 7th Framework Programme, EC

2. COINVEST (*Competitiveness, Innovation and Intangible Investments in Europe;* www.coinvest.org.uk)
   - Project coordinator: Jonathan Haskel, IC, UK
   - Countries: UK, France, Portugal, Germany, Sweden & Bulgaria
   - Period: No database as such
   - Funded by the 7th Framework Programme, EC

Comparative perspective

3. *Knowledge Based Capital* (OECD) Main characteristics:

- International harmonization of estimates
- Improve measurement at disaggregated levels: sectorial level
  - Estimate Organizational Capital (OC) for the US at the sectorial level
  - Construction of sectorial level series of investment in Software, R&D and OC for OECD countries
- Develop measurement guidelines for assets lacking standard procedures
  - Estimation of SNA series of R&D investment from Frascati Manual-based survey info
  - Construction of indicators of the “quality” of firms´ innovative property
  - Developed a task-based approach to measuring OC.
- Capitalization parameters
  - Depreciation rates for OC calculated from labour mobility data
  - Depreciation rates for R&D calculated from patent renewal data

Comparative perspective

4. INTAN-Invest (*Cross country intangible investment data* www.intan-invest.net)

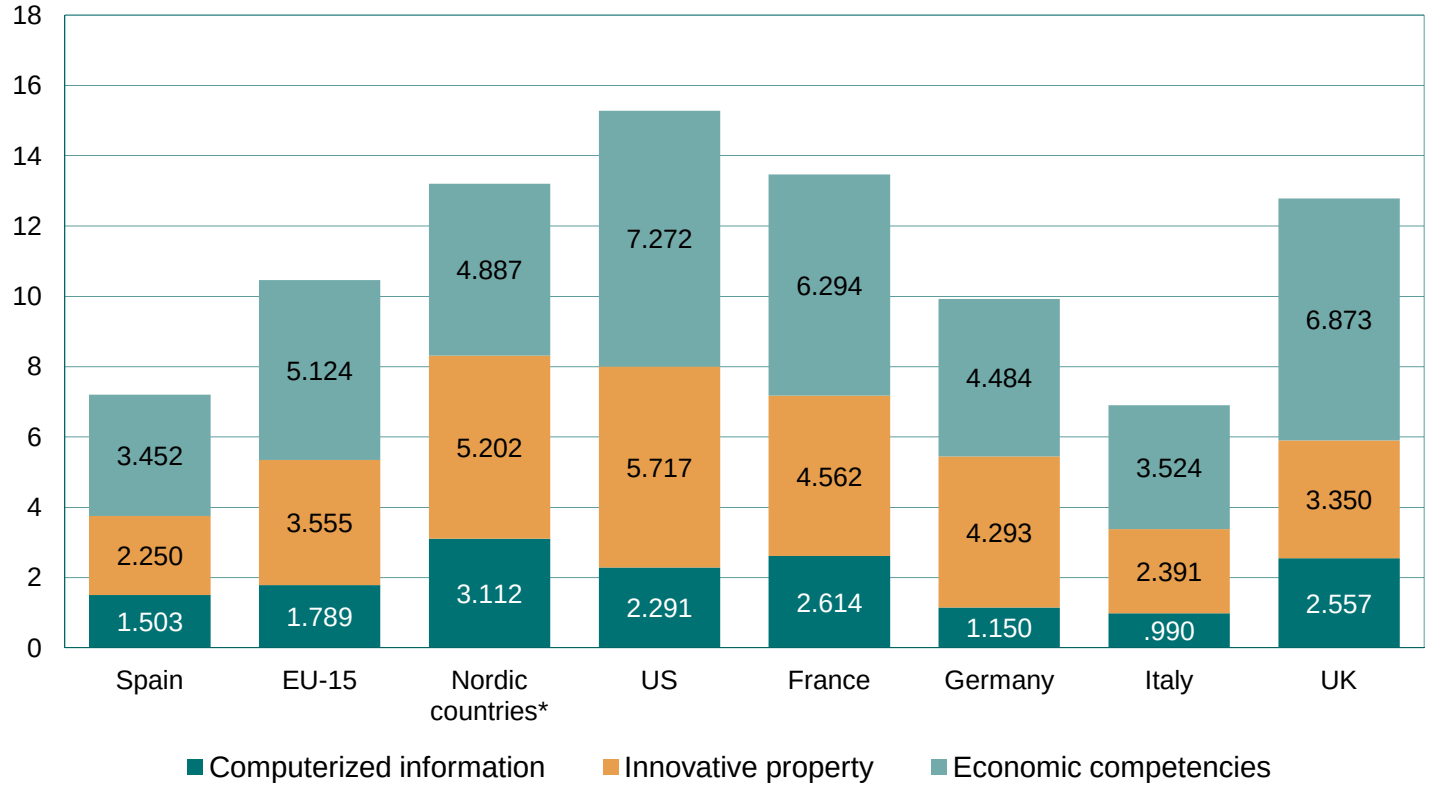
- Project coordinators: Carol Corrado (TCB, US); Jonathan Haskel (IC, UK); Cecilia Jona-Lasinio (LUISS, Italy); Maximiliano Iommi (ISTAT, Italy)
- Countries: EU-27 + Norway + USA
- Period: 1995-2010 (so far)
- Private sector of the economy. No sectorial disaggregation (so far)
- Objective: Getting an harmonized intangibles database for EU-27 plus Norway & US
- Making use of the information gathered by *INNODRIVE & COINVEST*

INTAN-Invest: Some results

(information for Spain coming from the Telefónica Foundation project)

Composition of the investment in intangible assets, 2010

Percentage of extended private GVA



* Sweden, Finland and Denmark.

Source: EU KLEMS, INE, INTAN-Invest and author's own calculations.

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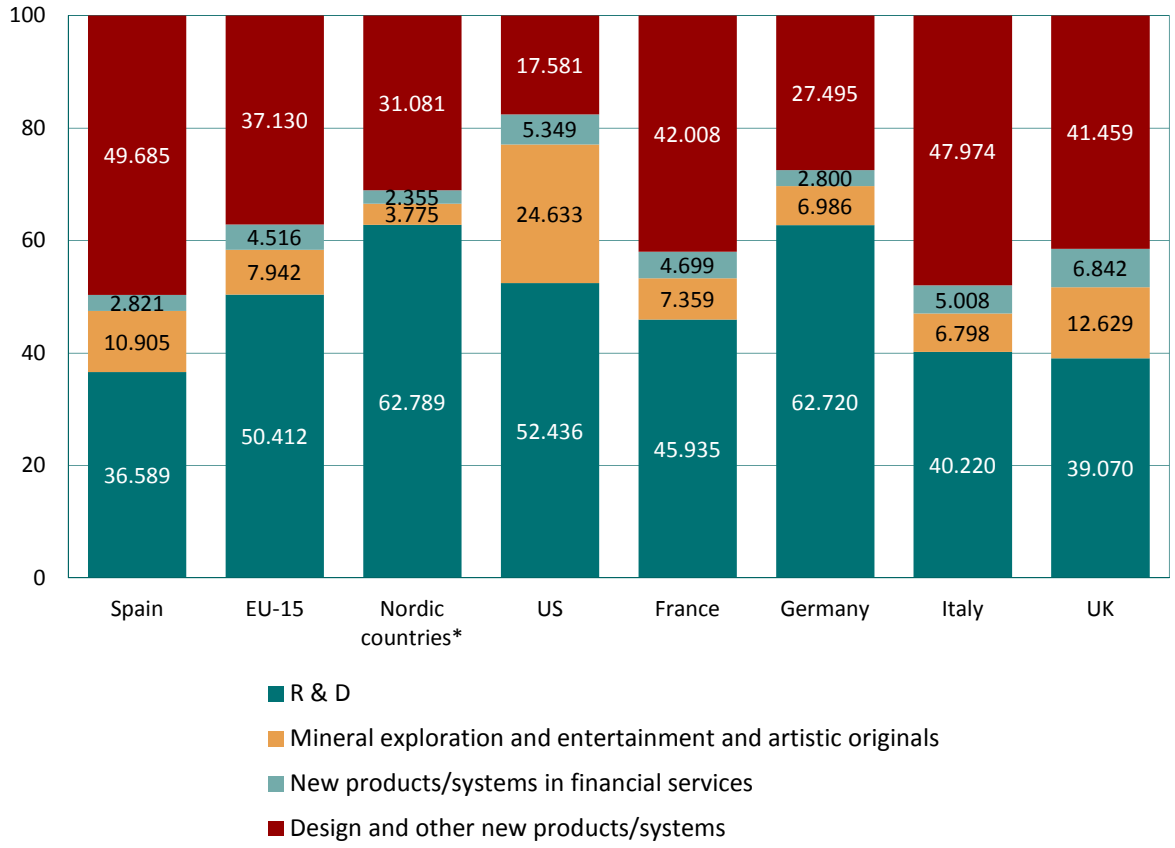
INTAN-Invest: Some results

(information for Spain coming from the Telefónica Foundation project)

Composition of the investment in *Innovative property*, 2010

Percentage



* Sweden, Finland and Denmark.

Source: INTAN-Invest and author's calculations.

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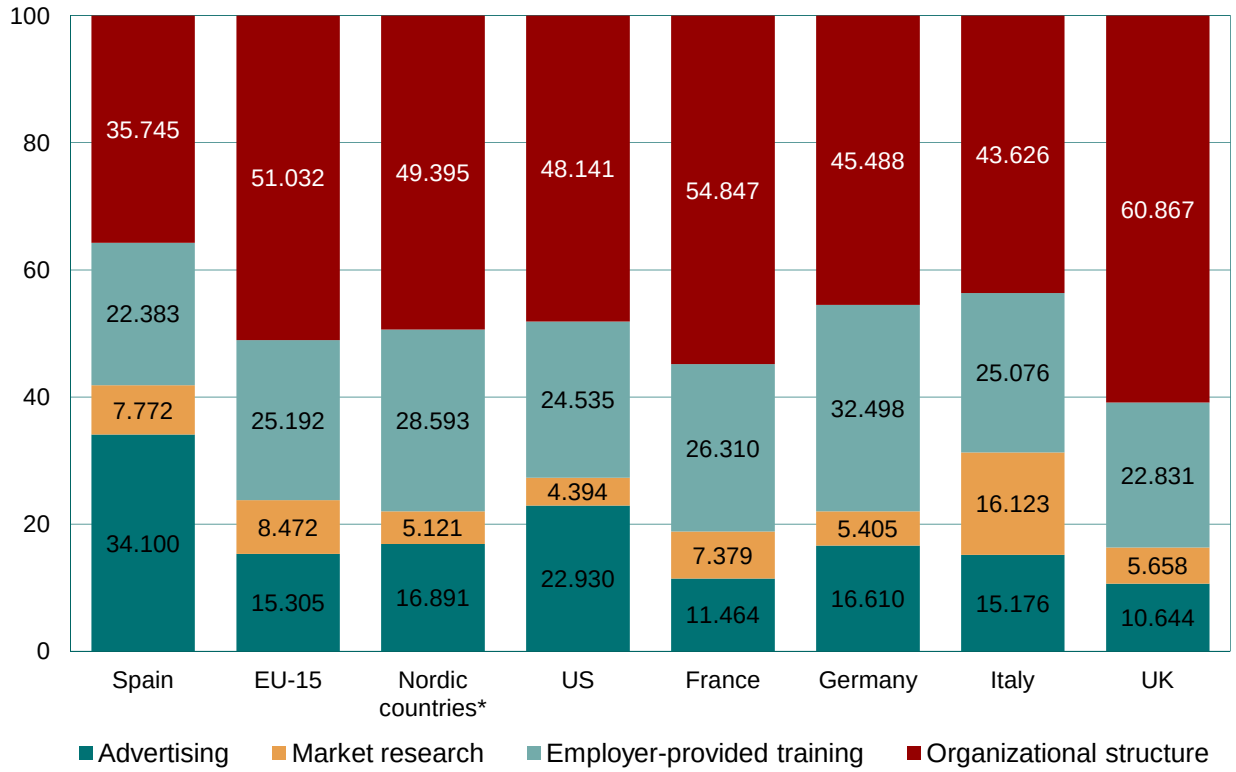
INTAN-Invest: Some results

(information for Spain coming from the Telefónica Foundation project)

Composition of the investment in *Economic competencies*, 2010
Percentage



* Sweden, Finland and Denmark.

Source: EU KLEMS, INE, INTAN-Invest and author's calculations.

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SPINTAN project

- The SPINTAN project is a competitive project funded by the 7th Framework Programme of the EC.
- It will run from December 1st 2013 to December 1st 2016
- It proposes to extend both, the theoretical and the empirical approach, introduced by CHS (2005, 2009) in order to include Public Sector intangibles.

Four objectives:

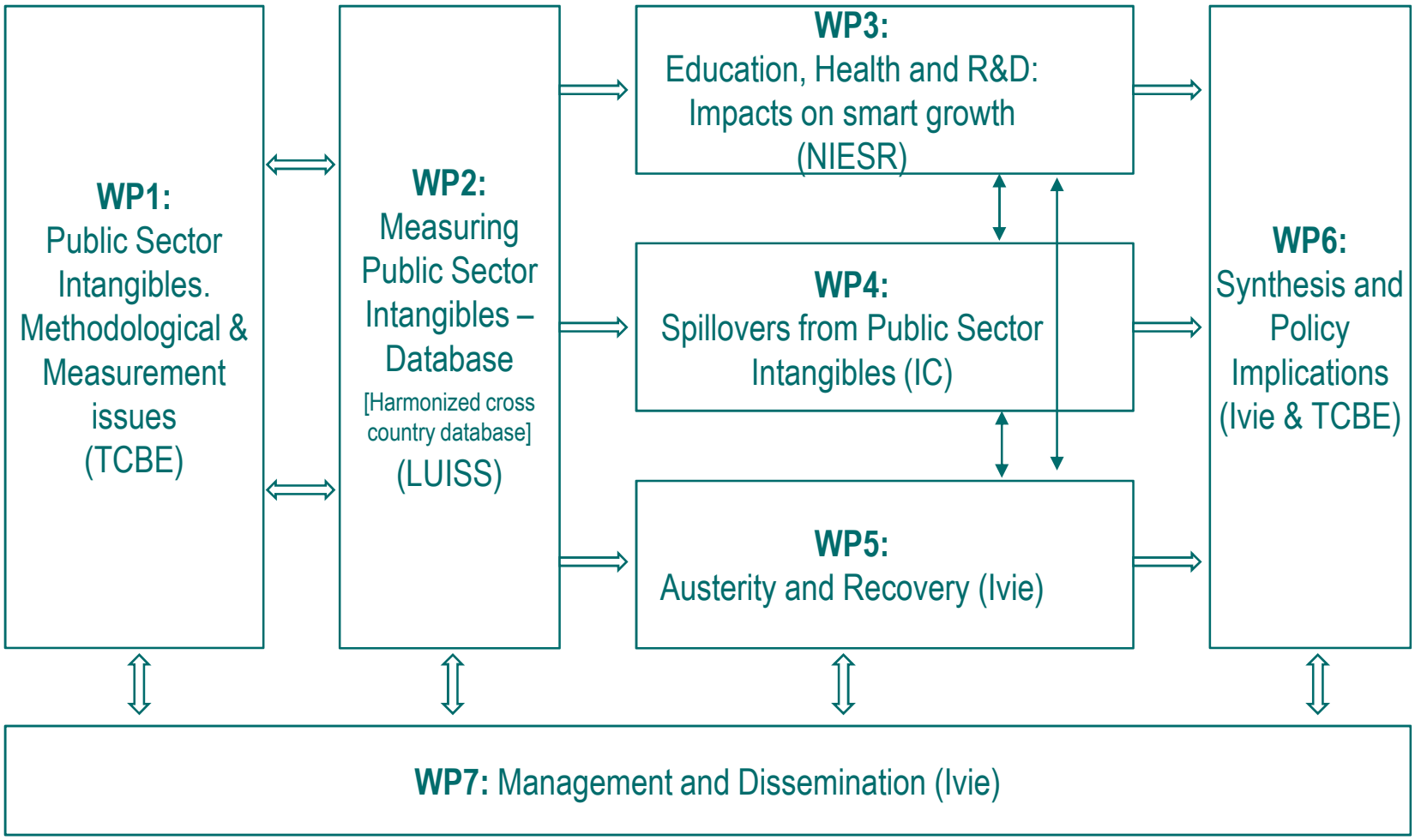
1. Building up a Public Sector Intangibles Database for a wide set of EU countries, supplemented with some big non-EU countries.
2. Analyze the impact of Public Sector intangibles on innovation, well-being and *smart* growth (including education, research and innovation and the creation of a digital society).
3. Analyze the spillover effects of intangibles and their interactions with other forms of capital (specially ICT).
4. Pay special attention to the consequences of austerity policies in view of the expected recovery.

SPINTAN project

Smart Public Intangibles: SPINTAN

	Participant organisation name	Country
Ivie	Instituto Valenciano de Investigaciones Económicas	Spain
NIESR	National Institute of Economic and Social Research	UK
LUISS	Lab of European Economics	Italy
Istat	Istituto Nazionale di Statistica	Italy
IC	Imperial College Business School	UK
TCBE	The Conference Board Europe	Belgium
OECD	Organisation for Economic Cooperation and Development	France
ZEW	Centre for European Economic Research	Germany
DIW	Deutsches Institut für Wirschaftsforschung	Germany
wiiw	Vienna Institute for International Economic Studies	Austria
FORES	Forum for Reforms, Entrepreneurship and Sustainability	Sweden
KOPINT	Kopint-Tárki Konjunktúrakutató Intézet Zrt.	Hungary

SPINTAN project



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Telefónica Foundation project

Intangibles en la Nueva Economía (Fundación Telefónica, forthcoming)

- Matilde Mas, Javier Quesada (Dirs.), Juan Fernández de Guevara & Ezequiel Uriel
- Country: Spain
- Period: 1995-2011
- Private sector of the economy
- Sectorial dissagregation: 24 sectors
  - Agriculture
  - Mining
  - Manufacturing (12 sectors)
  - Construction
  - Private services (9 sectors)

Telefónica Foundation. Sectoral dissagregation

Industrial classification and correspondence with CNAE 2009/NACE Rev. 2. Ivie's estimation

	Industries	CNAE 2009 / NACE Rev. 2
1	Agriculture, forestry and fishing	01-03
2	Mining and quarrying	5-9
3	Food products, beverages and tobacco	10-12
4	Textiles, wearing apparel, leather and related products	13-15
5	Wood and paper products; printing and reproduction of recorded media	16-18
6	Coke and refined petroleum products	19
7	Chemicals and chemical products	20-21
8	Rubber and plastics products, and other non-metallic mineral products	22-23
9	Basic metals and fabricated metal products	24-25
10	Computer, electrical and optical equipment	26-27
11	Machinery and equipment n.e.c.	28
12	Transport equipment	29-30
13	Other manufacturing	31-33
14	Electricity, gas and water supply	35-39
15	Construction	41-43
16	Wholesale and retail trade; repair of motor vehicles and motorcycles	45-47
17	Transportation	49-53
18	Accommodation and food service activities	55-56
19	Publishing, audiovisual and broadcasting activities	58-60
20	Telecommunications	61
21	IT and other information services	62-63
22	Financial and insurance activities	64-66
23	Professional, scientific, technical, administrative and support service activities	69-82
24	Other service activities	90-96

Sources

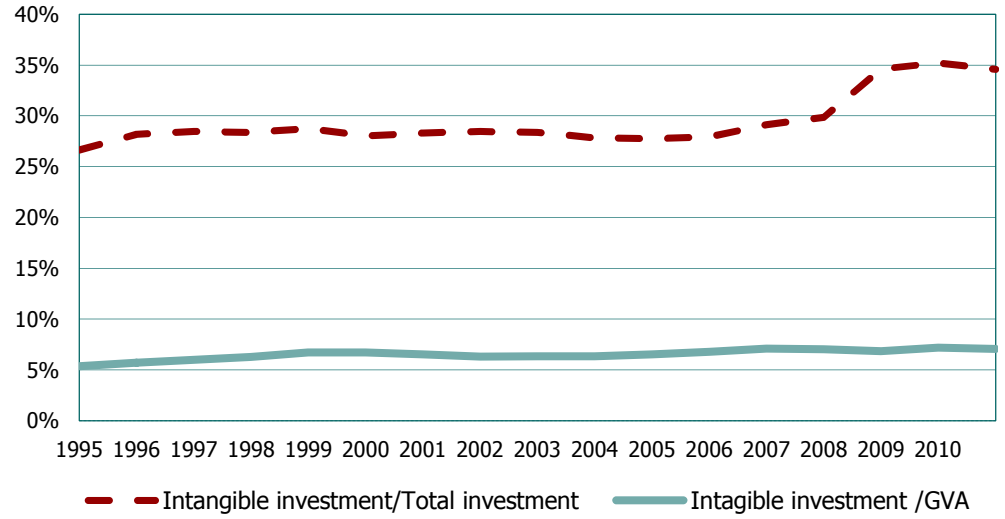
Intangible capital asset types	Sources
Computerized information	
1. Software 2. Databases	National Accounts (INE), EU KLEMS and BBVA Foundation-Ivie
Innovative property	
3. Mineral exploration	National Accounts (INE) and BBVA Foundation-Ivie
4. R&D (scientific)	Statistics about R&D activities (INE) and Technological Innovation Panel (PITEC) (FECYT)
5. Entertainment and artistic originals	National Accounts (INE) and BBVA Foundation-Ivie
6. New products/systems in financial services	Statistics about R&D activities (INE), EU KLEMS, Labour Force Survey (INE) and Structure of Earnings Survey (INE)
7. Design and other new products/systems	SBS-Services (INE), National Accounts (INE), EU KLEMS, IO and SUT (NA, INE)
Economic competencies	
8. Brand equity	
a. Advertising	National Accounts (INE), EU KLEMS, SBS-Services (INE), Infoadex, Nieto-Tamargo (1990), Pérez Ruiz (1995), WIOD and IO and SUT (NA, INE)
b. Market research	National Accounts (INE), EU KLEMS, SBS-Services (INE), AEDEMO, WIOD and IO and SUT (NA, INE)
9. Firm-specific resources	
a. Employer-provided training	Continuing Vocational Training Survey (CVTS) (Eurostat), National Accounts (INE), Labour Costs Survey (INE), Annual Labour Costs Survey (INE), Adult Education Survey (INE)
b. Organizational structure	National Accounts (INE), EU KLEMS, SBS-Services (INE), FEACO Survey, WIOD, IO and SUT (NA, INE), Labour Force Survey (INE) and Structure of Earnings Survey (INE), European Union Household Panel (EUHP) (INE)

Telefónica Foundation. Results

- Treating intangibles as investment, instead as intermediate consumption goods, will increase conventionally measured GVA by approximately 5%-6% on average. This % has slightly increased over the period.
- Intangibles investment represented around 27% of total non-residential investment. With the crisis it jumped to 35%.

Intangible investment. Private sector

Weight in total non-residential investment and extended GVA



Source: Fundación BBVA-Ivie, INE, EU KLEMS and author's calculations.

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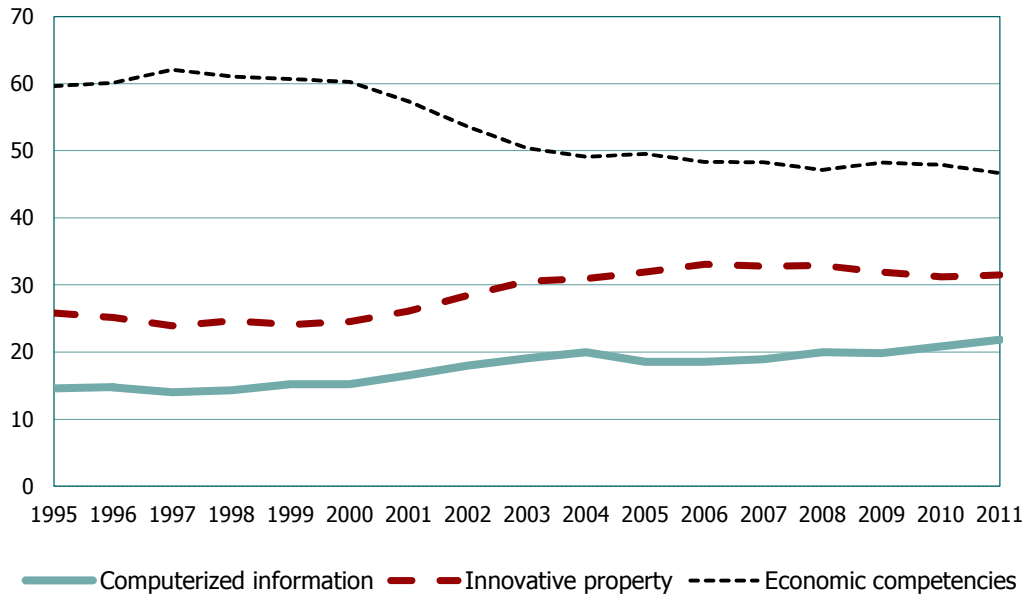
Telefónica Foundation. Results

- *Economic competencies* is the component with the highest share in total intangible investment, followed by *Innovative property* and *Computerized information*.

Composition of intangible investment. Private sector

Percentage



Source: Author's calculations.

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Telefónica Foundation. Results

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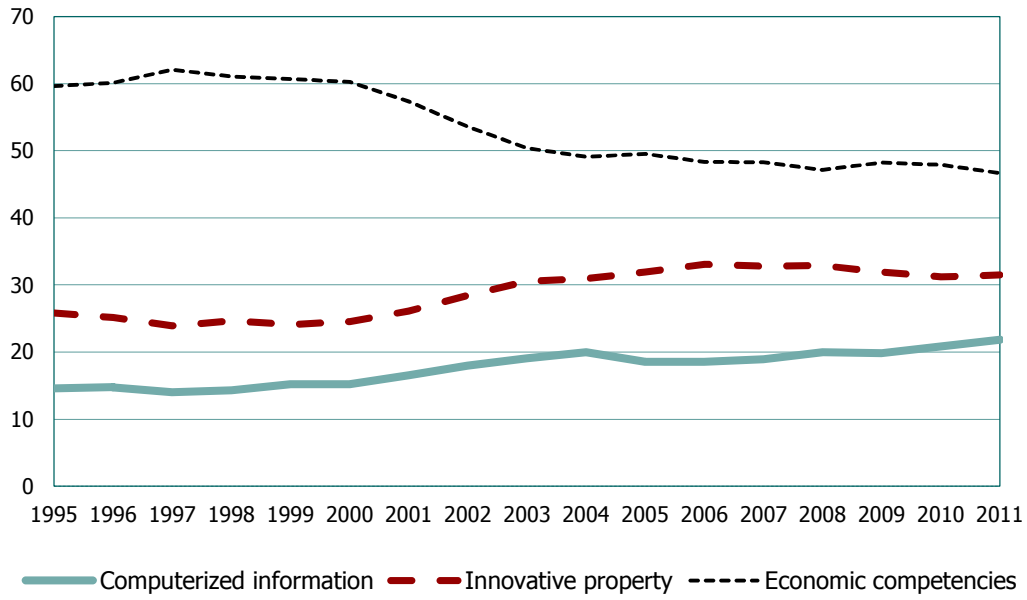
Composition of intangible investment. Private sector

Percentage



Source: Author's calculations.

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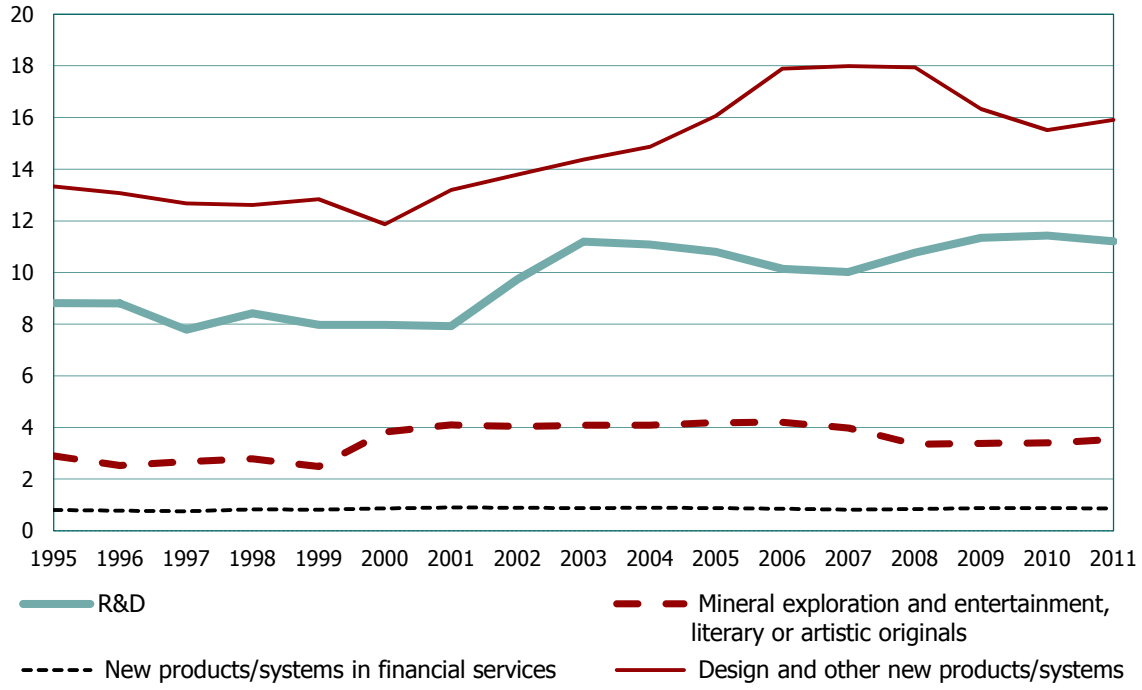
Telefónica Foundation. Results

- *Design* is the component with the highest share in *Innovative property* in Spain, followed by R&D

Composition of the investment in the *Innovative property*. Private sector

Percentage of total intangible investment



Source: Author's calculations.

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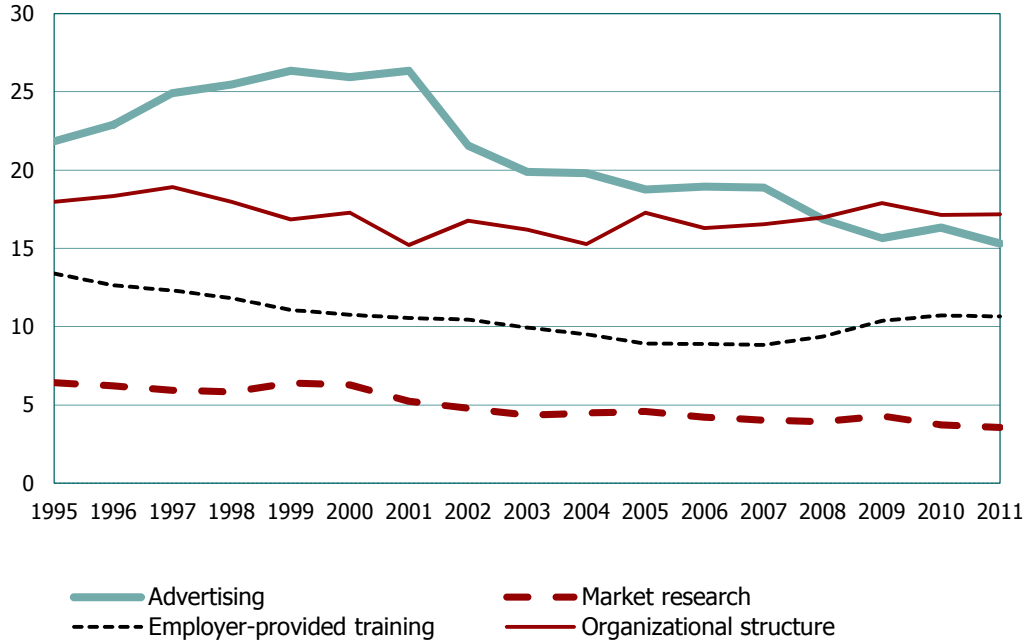
Telefónica Foundation. Results

- Investment in *Advertising*, followed by improvements in *Organizational structure*, have the highest share in the *Economic competencies* group

Composition of the investment in the *Economic competencies*. Private sector

Percentage of total intangible investment



Source: Author's calculations.

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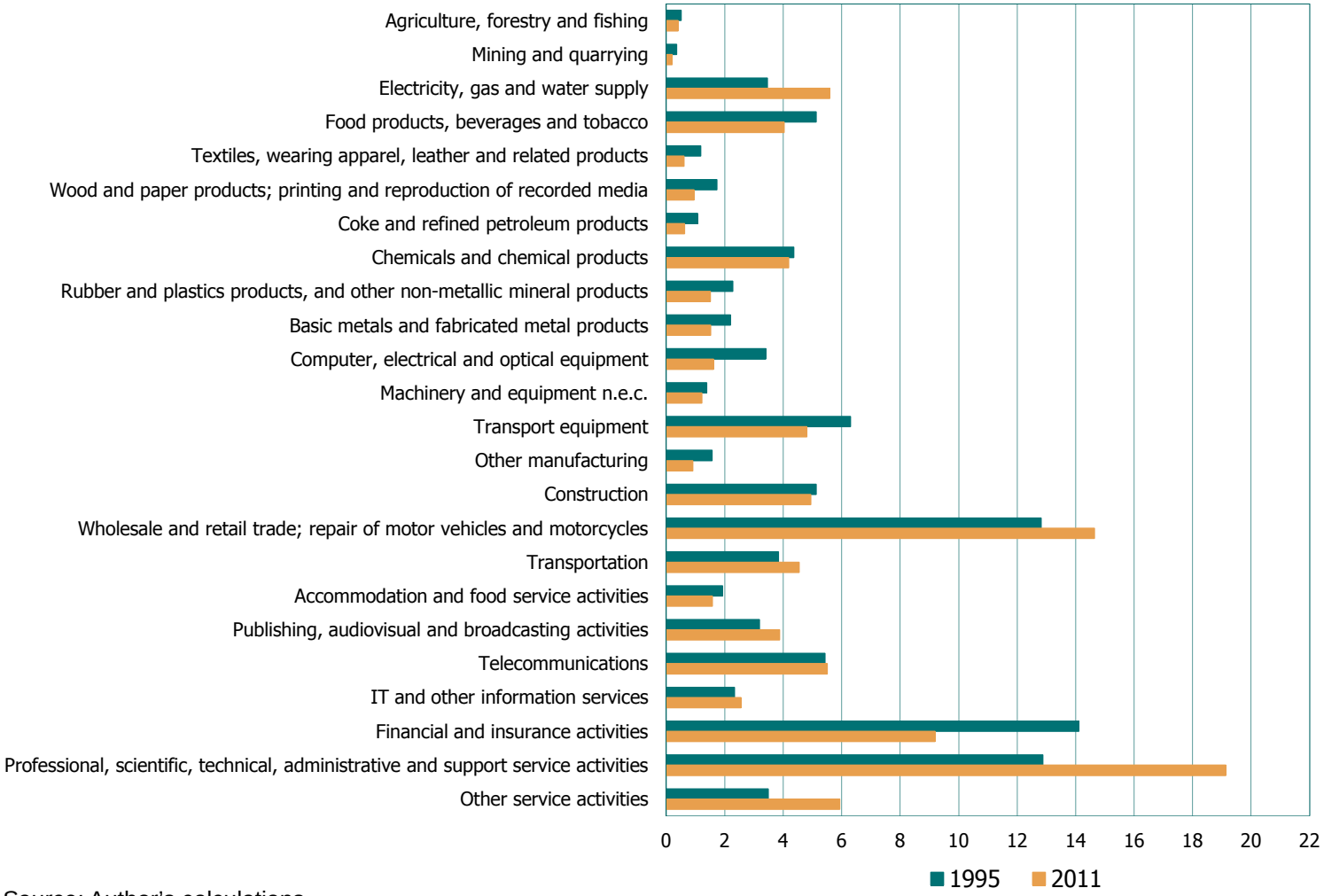
Three sectors: Profesional Services, Financial Intermediation, and Trade & Repair concentrate the highest share of Spanish intangible investment

Sectoral dissagregation of intangible investment. Private sector, 1995 y 2011

Percentage



Source: Author's calculations.

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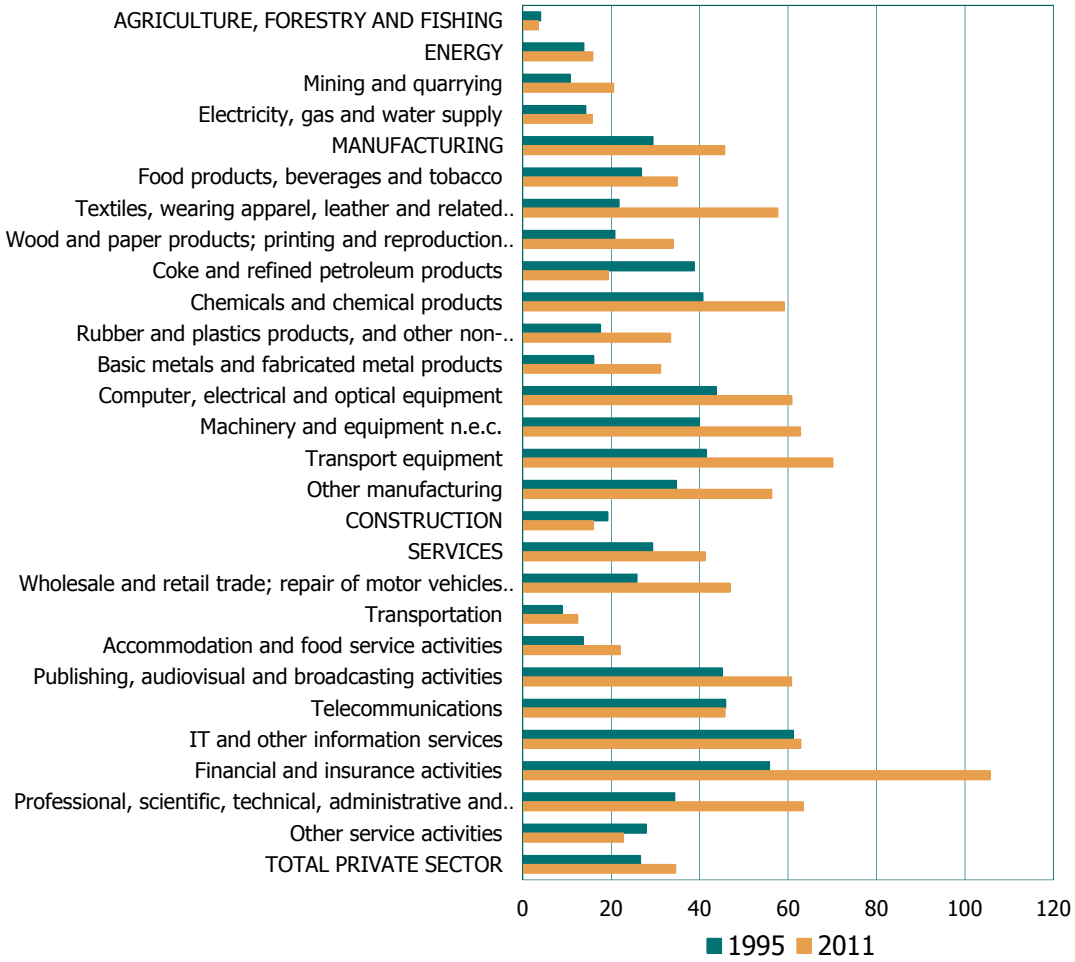
There are important differences among sectors in the weight of intangibles investment on total investment

Participation of intangible investment in non-residential total investment of each industry. Private sector, 1995 y 2001

Percentage



Source: Author's calculations.

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Growth Accounting Exercise

Contributions of extended labour productivity growth. Private sector (1995-2011)

Percentage

	1995-2011	1995-2007	2007-2011
Conventional labour productivity	**0.95**	**0.45**	**2.46**
1. Extended labour productivity growth	**1.01**	**0.54**	**2.41**
2. Contributions (in percentage points) to labour productivity growth (= 2.1 + 2.2 + 2.3)			
2.1. Total capital per hour worked (= 2.1.1 + 2.1.2 + 2.1.3)	**1.50**	**1.01**	**2.96**
2.1.1. ICT capital per hour worked	0.33	0.37	0.22
2.1.2. Other tangible capital assets per hour worked	1.03	0.55	2.48
2.1.3. Intangible capital per hour worked	0.14	0.10	0.25
2.2. Changes in labour composition	**0.29**	**0.34**	**0.14**
2.3. TPF	**-0.56**	**-0.63**	**-0.36**
3. TPF growth			
3.1. ICT sectors[1]	**0.03**	**0.03**	**0.02**
3.2. Other tangible sectors	**-0.57**	**-0.66**	**-0.30**
3.3. Intangible sectors[2]	**-0.03**	**-0.01**	**-0.08**
4. Contributions			
ICT (= 2.1.1 + 3.1)	0.36	0.40	0.25
Other tangible assets & sectors (= 2.1.2 + 3.2)	0.46	-0.11	2.18
Intangibles (= 2.1.3 + 3.3)	0.11	0.09	0.17

Note: The sum of the input contributions does not exactly match labour productivity growth. The difference is the reallocation effect..

[1] Computer, electrical and optical equipment, Telecommunications, and IT and other information services.

[2] Coke and refined petroleum products, Chemicals and chemical products and Transport equipment.

Source: EU KLEMS, Fundación BBVA-Ivie, INE and author's calculations.

Growth Accounting Exercise

- **Labour productivity (LP) is measured using the extended definition** (it includes the rents attributed to each sector intangibles) and calculated at sector level.
- LP was **sluggish in** the period **1995-2007**, but in the **crisis it has accelerated to a 2.4%** growth rate because of the massive **destruction of employment**.
- **Extended labour productivity growth is higher than conventional** in the **pre-crisis period**, whereas **just the opposite happened in the post-crisis period**, where this trend is reversed: conventional labor productivity growth is higher than the extended version.
  - This fact is due to the fact that in the years of the crisis, the share of investment in intangibles in GDP increased.

Factor accumulation

- 1995-2007
  - LP growth was based basically on the **accumulation of production factors**, specially tangible assets different from ICT (they account for 0.55pp), but also ICT capital (0.37) and intangibles (0.10). The increase in **human capital also accounted positively** (0.34).
  - **TFP contribution to labour productivity growth was highly negative** : -0.63.
- 2007-2011
  - **Negative contribution of TFP**, although half of the value shown during the expansion period (-0.36 vs -0.63)
  - **High contribution of Other tangible assets**, 4.5 times higher (2.48 vs 0.55), basically because the low depreciation rates and the destruction of employment.
  - **Reduction in the contribution of human capital** (0.14 vs 0.34).
  - **Intangibles assets increased their contribution** to LP growth, with 0.25, more than twice the contribution in the pre-crisis period.

Growth Accounting Exercise

Which types of assets are responsible for low TFP growth?

- The **contribution of sectors to TFP growth according to its ICT or intangibles intensity** (weight of intangibles in total capital services).
  - **ICT sectors:** *Computer, electrical and optical equipment, Telecommunications, and IT and other information services*.
  - **Intangibles sectors:** *Coke and refined petroleum products, Chemicals and chemical products and Transport equipment*.
  - **Other tangible sectors**: *Rest of industries*.
- The **large negative contribution** of TFP to productivity growth is **associated almost entirely to the Other tangible sectors**. ICT sectors contributed positively whereas the contribution of Intangible assets was negative -although small- and more negative in the crisis period.

What has been the contribution of each type of assets to LP growth?

- The contribution of the three types of assets to LP production can be calculated as the sum of: **1) their capital accumulation and 2) effect in efficiency gains (TFP)**.
- 1995-2007
  - **ICT assets are the main driver of LP growth**.
  - **Intangibles have a positive, but modest role**.
  - The rest of assets had a negative contribution.
- 2007-2011
  - **Other tangible assets were responsible for the soar of LP growth**.
  - ICT reduces its contribution but it is still relevant, although lower than in the expansion.
  - **Intangibles double their contribution to LP growth**.

Growth Accounting Exercise

Contributions to extended labour productivity growth of ICT capital and intangible capital. Private sector, 1995-2011

Percentage

	1995-2011	1995-2007	2007-2011
1. Labour productivity growth	**1,01**	**0,54**	**2,41**
2. Contributions of ICT capital per hour worked	**0,33**	**0,37**	**0,22**
2.1. Software	0,09	0,08	0,11
2.2. Hardware	0,14	0,17	0,05
2.3. Communications	0,10	0,11	0,07
3. Contributions of intangible capital per hour worked	**0,14**	**0,10**	**0,25**
3.1. Innovative property	0,09	0,06	0,16
3.1.1. R & D	0,04	0,03	0,06
3.1.2. Design and other new products/systems	0,04	0,02	0,10
3.1.3. New products/systems in financial services	0,00	0,00	0,00
3.2. Economic competencies	0,05	0,04	0,09
3.2.1. Brand equity	0,02	0,02	-0,01
3.2.1.1. Advertising	0,02	0,03	-0,01
3.2.1.2. Market research	0,00	0,00	0,00
3.2.2. Firm-specific resources	0,03	0,01	0,11
3.2.2.1. Employer-provided training	0,01	0,00	0,05
3.2.2.2. Organizational structure	0,03	0,02	0,06

Source: EU KLEMS, Fundación BBVA-Ivie, INE and author's calculations.

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Growth Accounting Exercise

Asset accumulation and LP growth?

- We have broken down the ICT and intangibles contribution to LP growth into each of the individual assets
- ICT assets:
  - Hardware is the ICT asset with the highest contribution, although the contribution of all types of assets is well balanced in the 1995-2007 period.
  - In 2007-2011 Software contributed more than the rest of assets.
- Intangible capital
  - Innovative property contribution to LP growth was higher than that of economic competencies both, before and after the crisis.
  - The increase in the contribution of intangibles after the crisis was driven basically by Design and Firm specific resources.

Econometric Estimates

- We **also estimate a production function** (per employee) **to test two hypotheses found** in the literature:
  - **Intangible and ICT are complementary assets**
  - **Intangible assets generate spillover effects**.
- We impose constant returns to scale and include fixed effects at industry level. Year dummies are also considered.
- **To measure the interaction** between intangibles and ICT assets we follow a similar approach to Oliner et al (2007) **aggregating both types of assets**. We aggregate them by means of a **geometric average**, using the user cost as weights.
- To **measure spillovers** we follow Hall et al (2009) and Goodridge et al (2012): we assume that **spillovers depend on the distance across sectors**.
  - We consider that the **stock of intangibles** (in levels, not their rates of growth or in terms of units of labor) **of other sectors** generate the spillover effect.
  - As an indicator of proximity we use the **percentage distribution of intermediate inputs industry** (INE and WIOD).
  - We consider that **spillovers are generated also by the interaction of ICT and intangible assets**.

Econometric Estimates

Labour productivity and intangibles

Dependent variable: labour productivity growth

	Without intangibles (GVA)			With intangibles (extended GVA)		
	Total period (1)	1995-2007 (2)	2007-2011 (3)	Total period (4)	1995-2007 (5)	2007-2011 (6)
ICT capital	0,127 ** (0,048)	0,121 *** (0,040)	0,250 * (0,140)	0,084 ** (0,039)	0,106 ** (0,039)	0,155 (0,161)
Non-ICT capital	0,323 *** (0,106)	0,356 *** (0,113)	0,117 (0,160)	0,106 (0,078)	0,256 ** (0,107)	-0,024 (0,185)
Intangible capital				0,398 *** (0,078)	0,191 *** (0,065)	0,370 * (0,208)
Constant	0,013 (0,010)	-0,004 (0,006)	0,013 * (0,008)	0,010 (0,008)	-0,006 (0,006)	0,011 * (0,006)
Observations	384	288	96	384	288	96
Adjusted R^2	0,226	0,275	0,181	0,317	0,317	0,221
Equality of coefficients between periods: F-test (p-value)		3,08 (0,048)			5,90 (0,002)	

Note: Labour productivity has been calculated using employment corrected by the composition of human capital and hours worked. All variables are in logarithmic differences and weighted by employed person. Specifications include sector and time fixed effects. Heteroskedasticity robust standard errors in parentheses. ***, **, *: significant at 1%, 5% and 10% levels, respectively.

Source: Author's calculations.

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Econometric Estimates

Labour productivity and the interaction between intangibles and ICT assets

Dependent variable: labour productivity growth

	1995-2007 (1)	2007-2011 (2)
Non-ICT capital	0,264 ** (0,110)	0,036 (0,174)
Interaction between ICT capital and intangible capital	0,286 *** (0,063)	0,430 ** (0,154)
Constant	-0,006 (0,006)	0,010 (0,007)
Observations	288	96
Adjusted R^2	0,324	0,225
Equality of coefficients between periods: F-test (p-value)	4,38 (0,014)	

Note: Labour productivity has been calculated using extended GVA and employment corrected by the composition of human capital and hours worked. All variables are in logarithmic differences and weighted by employed person. Specifications include sector and time fixed effects. Heteroskedasticity robust standard errors in parentheses.

***, **, *: significant at 1%, 5% and 10% levels, respectively.

Source: Author's calculations.

Econometric Estimates

Intangibles, spill-over effects and labour productivity

Dependent variable: labour productivity growth

	1995-2007 (1)	2007-2011 (2)	1995-2007 (3)	2007-2011 (4)
ICT capital	0,090 **	0,204		
	(0,042)	(0,174)		
Non-ICT capital	0,319 **	0,037	0,324 **	0,123
	(0,127)	(0,204)	(0,129)	(0,203)
Intangible capital	0,165 **	0,217		
	(0,069)	(0,298)		
Interaction between ICT capital and intangible capital			0,249 ***	0,325
			(0,072)	(0,204)
ICT intensity × intangible capital spillovers (S)	0,027 **	0,100	0,027 **	0,095
	(0,010)	(0,071)	(0,011)	(0,056)
Constant	-0,028 **	-0,076	-0,027 **	-0,070
	(0,011)	(0,062)	(0,011)	(0,046)
Observations	288	96	288	96
Adjusted R^2	0,327	0,229	0,335	0,232
Equality of coefficients between periods: F-test (p-value)	11,54 (0,000)		9,71 (0,000)	

Note: Labour productivity has been calculated using extended GVA and employment corrected by the composition of human capital and hours worked. All variables in logarithmic differences and weighted by employed person. Specifications include sector and time fixed effects. Heteroskedasticity robust standard errors in parentheses. ***, **, *: significant at 1%, 5% and 10% levels, respectively.

Source: Author's calculations.

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Econometric Results

- Very preliminary results show that:
  - The **contribution of intangibles to production is positive** and statistically significant, specially in the pre-crisis period.
  - The **interaction between ICT assets and intangibles is also significant**, showing the **complementary role** they play: they reinforce themselves.
  - We found *spillover effects in the 1995-2007 period*, but not in the years of the crisis.
    - **The greater the level of intangibles** (not their growth, nor the quantity per-unit-of labour) the greater the spillovers.
    - But **they have to interact with ICT assets**

Final Remarks

- There is at present a strong movement for widening the sources of growth perspective.
- Intangibles assets are taken the lead. R&D has been always identify as an important source of growth, but more relevant aspects –such as improvements in the fuctioning of the firms- are being included.
- One of the advantages of the CHS approach is that it stays within the NA bounderies, so intangibles can enter smoothly into the KLEMS framework.
- However, the characteristics of the new intangible assets facilitates the departure from the neoclassical mainstream model to a more Shumpeterian perspective.
- There are already estimates of intangible capital for the EU countries, the US, and the most relevant countries. The only LA countries for which estimates are available so far is Brazil

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