ICT, R&D and Non-R&D intangible capital: complementary relations and industry productivity growth in European countries

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Introduction

- Our aim
- **INTAN-Invest** Harmonised Measures of Intangible Investment
- ICT, R&D and Non-R&D Intangible Capital:
  - New sources of growth in EU countries-industries
  - Complementary relations and productivity growth
- Summing up and next research steps
Our aim

• Provide descriptive evidence on the dynamics and intensity of intangible investments in a sample of European countries in 1995-2010.
• Assess the impact of intangible capital on European industry productivity growth focusing on the contribution of 3 asset categories and their synergies:
  • ICT, R&D and Non R&D Intangibles
Motivation

Based on an econometric analysis of a 10 country, 10 year KLEMS sample of productivity growth in the EU, Corrado, Haskel and Jona-Lasinio (2014) \(^1\) found:

- Productivity in ICT-intensive industries is stronger in countries with relatively fast-growing intangible capital, suggesting complementarity between ICT and intangible capital
- Non-R&D intangible capital generates productivity spillovers
- Are the spillovers they found the product of knowledge diffusion or complementarity (or both)?
- With this dataset we will be able to better understand the underlying mechanisms, as policy implications may not be necessarily the same.

\(^1\)Revised, working paper version of paper initially presented at 2nd World KLEMS conference, August, 2012.
Complementary assets, innovation and productivity growth: main transmission channels

ICT

Non R&D INTG

R&D

INNOVATION

PRODUCTIVITY
The data

- **INTAN-Invest** harmonized cross country industry estimates of intangible investments (www.INTAN-Invest.net)
  - Country coverage: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom.
  - Industry coverage: NACE Rev2 sectors A through N (excluding real estate) plus sectors R and S.
  - Time coverage: 1995-2010

- **EUKLEMS** (2012 release)
Intangible investments (chain linked volumes): compounded average rates of growth 1995-2010

Manufacturing vs Services

Manufacturing: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom

Services: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, United Kingdom
Map 1 – Value added share of R&D: Manufacturing and Services
(Percenatge values)

Source: EUROSTAT
Non-R&D Intangible intensity: average values 1995-2010

Map 2 – Value added share of Non-R&D intangibles: Manufacturing and Services
(Percentage values)

VA share of Non R&D Intangibles - Manufacturing (Average shares 1995-2010)

VA share of Non R&D Intangibles - Services (Average shares 1995-2010)

Source: INTAN –Invest
Map 3 – Value added share of ICT: Manufacturing and Services
(Percentage values)

VA share of ICT - Manufacturing (Average shares 1995-2010)

VA share of ICT - Services (Average shares 1995-2010)

Source: EUKLEMS
Stylised facts

- Intangible capital accumulation more dynamic in services than manufacturing (excluding Finland)
- R&D, Non-R&D and ICT average intensities:
  - Broad differences between Northern and Southern Europe
  - Northern countries relatively more intangible and ICT intensive than Southern countries
  - Differences are maintained across Manufacturing and Services
  - Services are more intensive in Non-R&D Intangibles and ICT than manufacturing
  - Manufacturing is more R&D intensive than services
Extended Growth Accounting Model

European countries:
- AT, FI, FR, DE, ES, IT, NL, UK

Industries:
- Agriculture, Mining, Manufacturing, Utilities, Construction, Trade, Financial services, Other services

Asset categories and sub-categories:
- Tangible Non-ICT, ICT, R&D, and Non-R&D intangibles
  - Software, R&D, Arch-Des, NFP, Min-Art, Adv-Mkt, Org cap, Training
Contributions to labour productivity growth: 1995-2009

C. Jona-Lasinio
INTAN-Invest
• More **intangible**-intensive economies are the faster growth performers. More **tangible**-intensive countries are the slower growth performers.

• **ICT** exceeds tangible **non-ICT** capital contribution in the best performers. The opposite holds in the slow growing economies.

• **R&D** and **Non-R&D** intangibles are relevant sources of growth in almost all sample countries but
  
  • ICT, R&D and Non-R&D intangible capital contribution is higher than tangible non-ICT capital contribution in fast growing countries;
  
  • Overall contribution of R&D and Non-R&D intangibles is relatively low in the slow growing economies;
  
  • Non-R&D intangible contributes more than R&D capital deepening.
Industry contributions to labour productivity growth: 1995-2009

![Bar chart showing contributions to labor productivity growth by industry and country from 1995 to 2009. The chart is color-coded for different industries: Agriculture & Fishing, Manufacturing, Other industries (2), Trade, Financial Services, and Other Services. Each country is represented with a bar that is divided into segments showing the contribution of each industry. The chart includes the countries IT, ES, DE, FR, NLD, AT, FI, and UK.](image-url)
R&D and Non-R&D Intangible Capital Deepening: contributions to industry productivity growth 1995-2009

Manufacturing+Trade+Financial+Services+Other Services

- Italy_R&D
- Italy_Non-R&D
- Spain_R&D
- Spain_Non-R&D
- Germany_R&D
- Germany_Non-R&D
- France_R&D
- France_Non-R&D
- Netherlands_R&D
- Netherlands_Non-R&D
- Austria_R&D
- Austria_Non-R&D
- United Kingdom_R&D
- United Kingdom_Non-R&D
- Finland_R&D
- Finland_Non-R&D

Manufacturing | Trade | Financial Services | Other Services
• High heterogeneity of industry contributions to productivity growth
  • Manufacturing (R&D intensive) is the driving sector in FI, Services (Non-R&D Intangible intensive) in NLD, AT and UK
• On average, Non-R&D Intangible capital provides a higher contribution than R&D and mainly in the service sectors
• ICT and Non-R&D Intangibles are the main drivers of services productivity growth.
• Intangible assets may have a stronger effect on productivity growth when interacted with other variables, particularly with ICT.
• Main assumption is that intangible assets complement ICT capital so that to realize the potential benefits of computerization, investments in additional assets such as new organizational processes and structures and more trained workers are necessary (Bresnahan, Brynjolfsson, and Hitt (2002)).
• Productivity growth is higher once the complementary role of intangibles is accounted for (Dahl, Kongsted, and Sorensen (2011); Black and Lynch (2003), Caroli and Van Reenen (2001) and Dearden, Reed and Van Reenen (2006)).
ICT vs Non-R&D Intangibles
Summing up

- Non-R&D intangibles and ICT are relevant sources of productivity growth in advanced economies.
- Strong correlation between Non-R&D intangibles and ICT suggests they are strategic policy variables.
- The analysis of the transmission channels through which intangible capital and its synergies with ICT affect industry productivity growth are future key research issues.
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