INVESTMENT IN KNOWLEDGE BASED CAPITAL AND BACKWARD LINKAGES IN GVCs

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OECD
BETTER POLICIES FOR BETTER LIVES

The question

The question: In what ways are intangible (KBC) investment and participation to GVCs related?

Why is this important?

- Contribute to explain industry performance, and in particular dynamics of productivity (GVC, KBC).
- Contribute to explain success/failure in GVCs.
- If jointly determined => design of public policy. Direct and indirect effects of programs.

This paper

- Different modes of GVC participation:
  - Domestic & foreign offshore-outsourcing. TiVA!
  - Backward linkages
- Different KBC assets : OC, software, R&D
  - OC estimated from Le Mouel & Squicciarini (2015)
  - Software = SNA investment + purchases of ICT services (ICIO)
- Cross-country analysis at the industry level:
  - 21 EU countries + U.S.A.
  - 27 industries (including public sectors)
  - 2000-2011

This paper: contribution

Results:

- Confirms complementarity between KBC assets *(NOT in this presentation).*
- Finds *negative* link between KBC and domestic outsourcing of inputs, and a *positive* one for KBC and offshoring of inputs.

Contributions:

- Estimate new panel of OC investment at industry-country
- Reproduce boom of ICT services across EU/US
- Introduce greater complexity in the analysis of KBC-GVC
- Treat endogeneity

Literature & Channels

GVC => KBC

- Access to imported inputs of greater tech content and lower cost (Boler et al., 2015). Incentives to upgrade production process.
- At industry level: reallocation of market shares from exiting, low tech to surviving, high-tech firms (Bloom et al., 2015).
- Substitution of KBC with intermediate inputs.

KBC => GVC:

- Value creation from R&D, design, marketing, IP, which require tacit and non-tacit knowledge (OECD, 2013).
- Greater flexibility, quality of outputs, & ability to monitor production across borders (Bloom et al., 2016).
- KBC => skilled labor (Caroli and Van Reenen, 2001).

Data (1): GVC

- **Trade in Value Added**. Net contribution of domestic vs foreign VA in production and trade
  - *(narrow) Input Offshoring :* imported intermediates
  - *(narrow) Input Domestic Outsourcing*
  - *Offshore-outsourcing of service inputs*.
  - We cannot observe V.I. vs arm's length, nor explicit home-abroad substitution patterns.

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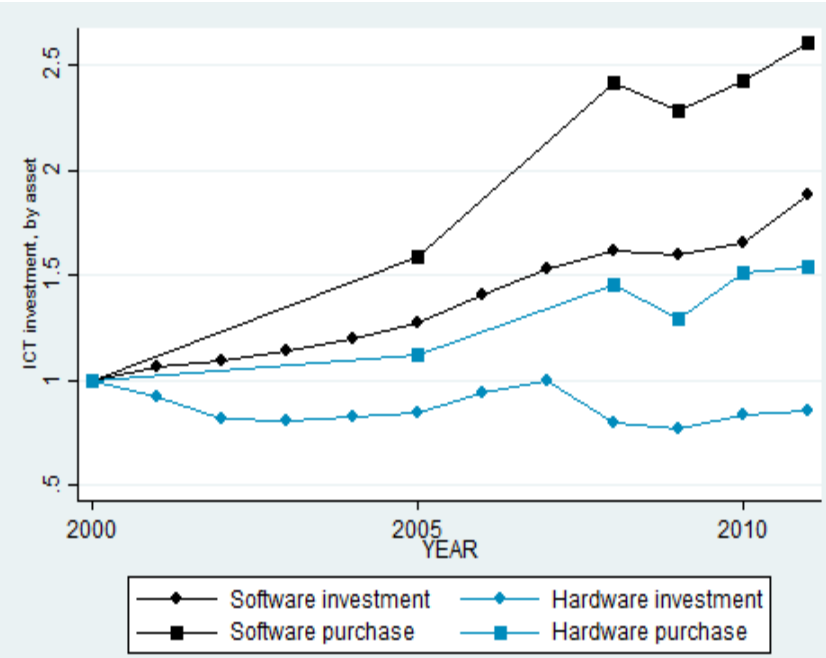
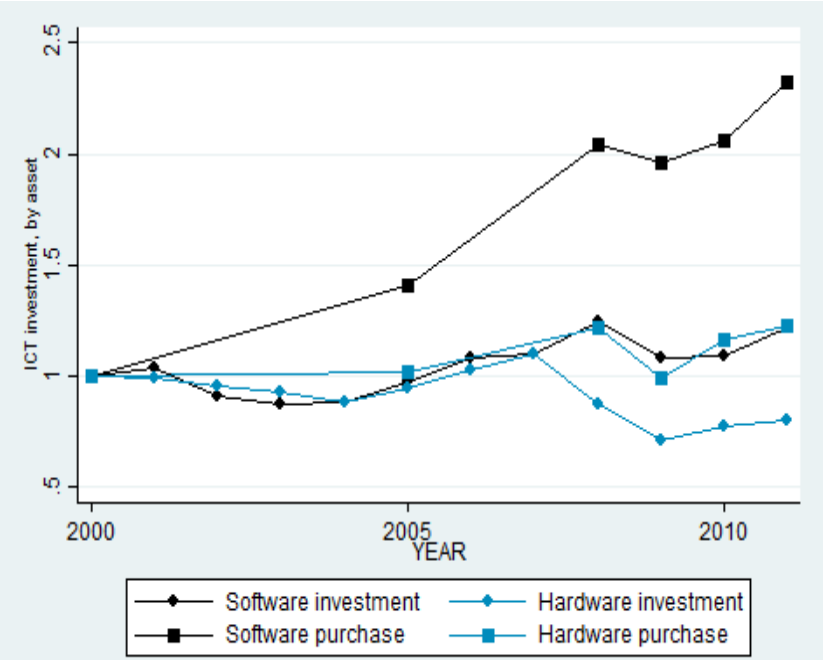
  - We cannot observe V.I. vs arm's length, nor explicit home-abroad substitution patterns.
- **NEW** : purchases of ICT services (from ISIC3 #72) and ICT equipment (ISIC3 #30, 32, 33).
  - ICIO: 2000, 2005, 2008-2011 only

Data (1): Investment vs Purchases of ICT

(a) Whole economy



(b) Manufacturing



- "Software purchase" == purchases of ICT services (ICIO, ISIC3 class 72)

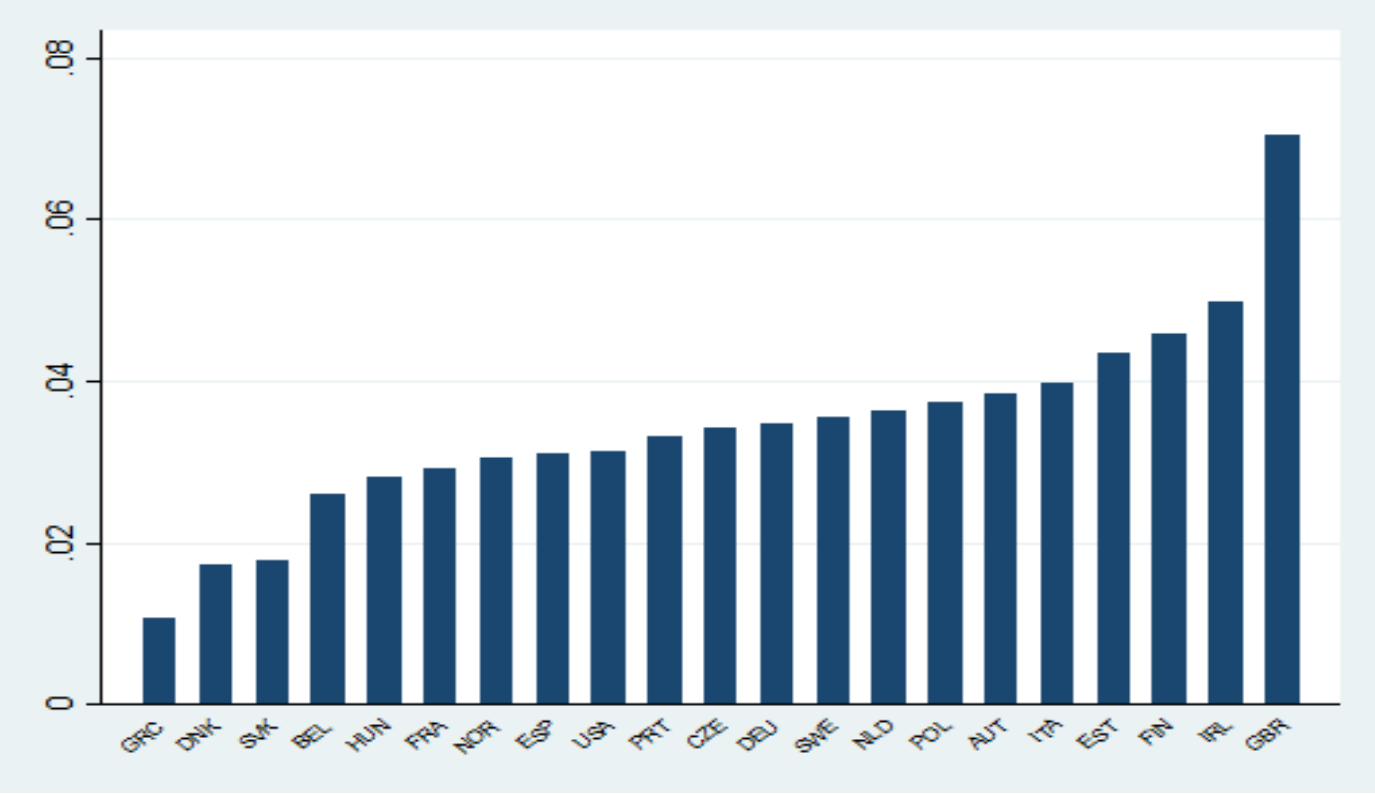
Data (2): Investment in Organisational Capital

- Knowledge embodied in people => HK approach to KBC
- KBC generated by specific tasks affecting LT :
  1. Le Mouel & Squicciarini (2015) for selection of OC tasks (PIAAC) => list of OC-intensive 3dig occupations.
  2. Assume intensity of occupations constant in time. Matrix of occupationXsector employment and wages from CPS, EUSES and EULFS. No self-employed.
  3. 20% of expenditure in OC employees is investment.

     => **industry-country panel of OC investment**

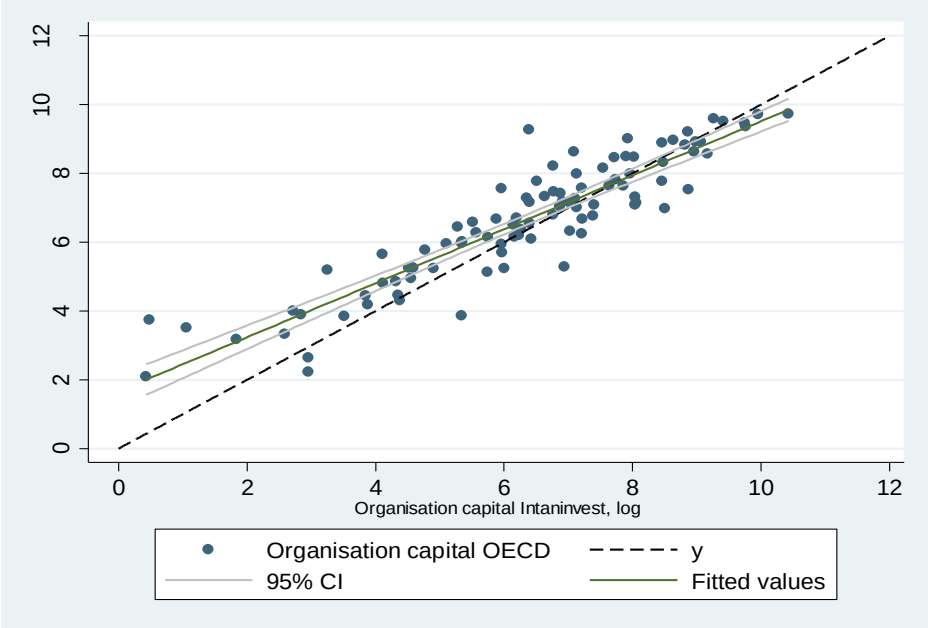
Data (2): Investment “Intensity”

OC investment over adjusted VA (2011).
Average across sectors in the economy



Validation

- Positive correlation with VA/N
- Correlation with INTAN-Invest: Log OC investment, business sectors, 2010:



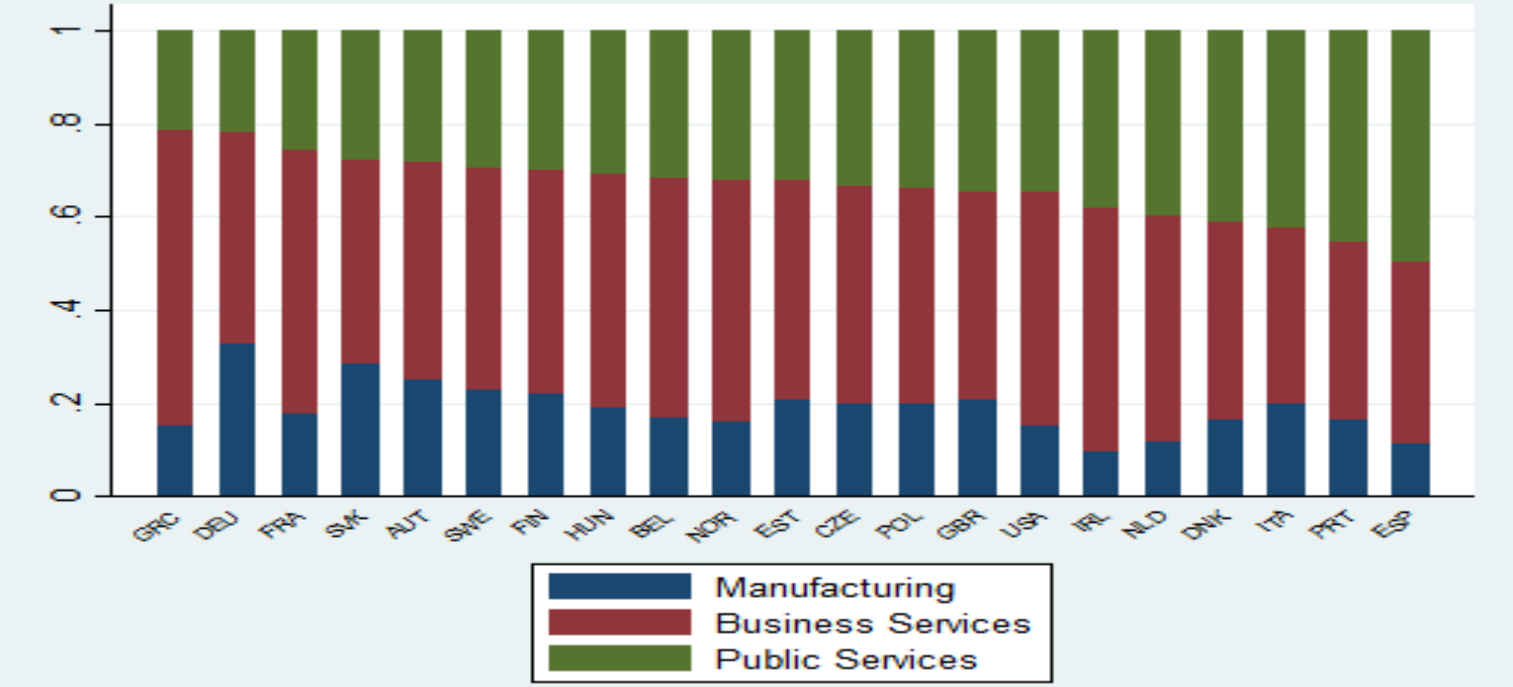
- Comparison with World Management Survey (2004-2010, manufacturing): positive but small correlation

OC in the public sector

- Non managerial tasks are especially important in public.
- No separate identification of tasks wrt private sector.
  - If more delegation in private sector, using the same task-occupation mapping: overestimate public , underestimate private OC.
- Assuming $\overline{w}_{pub} < \overline{w}_{priv}$ by occupation: counterbalancing effect (but still mis-measured)
- Either way: correcting for role of public firms in non-SPINTAN sectors?

OC in the public sector

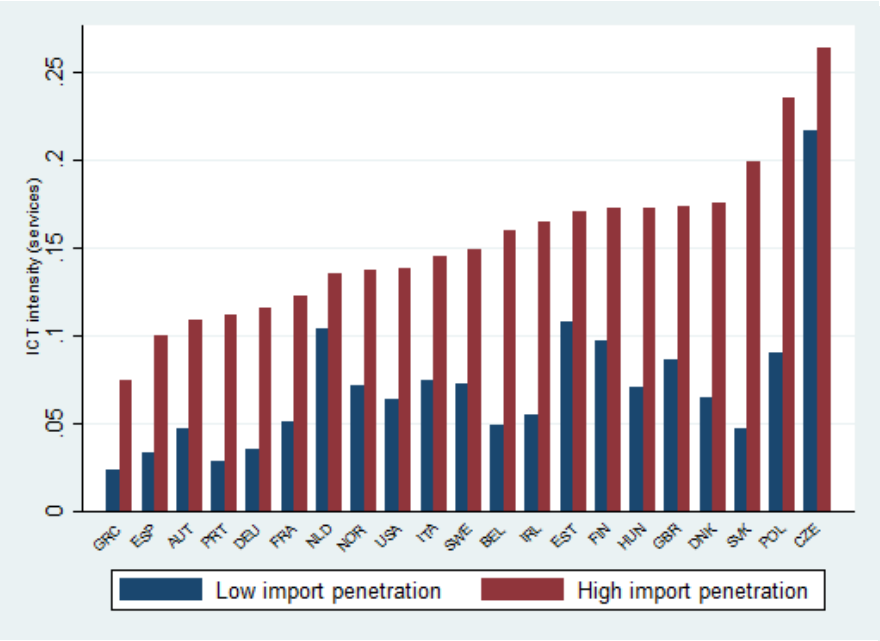
OC investment by macro industry (2011).
Average across sectors in the section



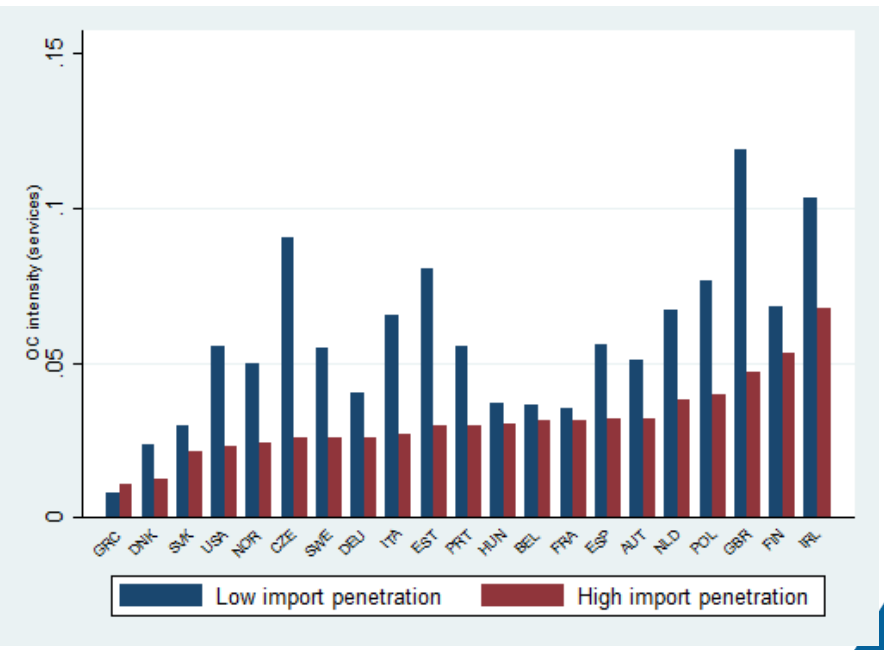
KBC and GVC

Investment “intensities” in high/low offshoring sectors
(average across all service industries, 2011)

(a) ICT / VA



(b) OC / VA



DSTI/EAS/IND/WPIA(2015)3

The empirical specification

$$GVC_{i,k,t} = \beta_0 + \beta_1 Ln\left(INTG_{i,k,t}\right) + \beta_2 \boldsymbol{X}_{i,k,t} + \varphi_{ik} + \rho_t + \varepsilon_{i,k,t} \qquad (1)$$

$$Ln\left(INTG_{i,k,t}\right) = \gamma_0 + \gamma_1 GVC_{i,k,t} + \gamma_2 \boldsymbol{W}_{i,k,t} + \pi_{ik} + \theta_t + \nu_{i,k,t} \qquad (2)$$

- In FE
- And IV: tests & intuition. E.g. share of young people in the workforce, share of ICT workers, patenting activity, trade connections with China, access to telecom by population, etc.

- $\beta_1, \gamma_1 > 0$: technology upgrade, flexibility of production, reallocation of market shares to high-tech firms.
  $\beta_1, \gamma_1 < 0$: substitute investment with intermediate inputs; externalisation of production.

Estimation results (1) : KBC => GVC

	(1) Dom_Out	(2) Dom_Out_M	(3) Offsh	(4) Offsh_M	(5) Serv	(6) Serv_M
Log Invt OC	-0.084***	-0.063***	-0.075***	-0.055***	0.026**	0.030***
	(0.024)	(0.016)	(0.026)	(0.017)	(0.010)	(0.006)
Log VA/Employees	0.025***	0.019***	0.009	0.002	-0.015***	-0.020***
	(0.006)	(0.003)	(0.007)	(0.004)	(0.003)	(0.002)
Log Tangible K	0.004***	0.003***	0.001	0.002*	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Employment	0.081***	0.064***	0.048***	0.028**	-0.031***	-0.038***
	(0.017)	(0.011)	(0.018)	(0.012)	(0.007)	(0.005)
Observations	7,356	3,634	7,328	3,634	7,356	3,662
Sargan P-value	0.524	0.623	0.715	0.738	0.333	0.198
Industry-Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES

Estimation results (2) : KBC => GVC

	(1) Dom_Out	(2) Dom_Out_M	(3) Offsh	(4) Offsh_M	(5) Serv	(6) Serv_M
Log Invt Softw	-0.021***	-0.031***	0.009**	0.010*	0.057***	0.085**
	(0.005)	(0.006)	(0.005)	(0.006)	(0.018)	(0.038)
Log VA/Employees	0.013***	0.017***	-0.013***	-0.007***	-0.037***	-0.040***
	(0.002)	(0.003)	(0.002)	(0.002)	(0.008)	(0.012)
Log Tangible K	0.004***	0.002**	-0.001	-0.001	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Log Employment	0.037***	0.039***	-0.009**	-0.005	-0.050***	-0.067***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.012)	(0.021)
Observations	7,356	3,662	7,356	3,596	6,292	3,403
Sargan P-value	0.497	0.801	0.078	0.716	0.281	0.146
Industry-Country FE	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES

Estimation results (3) : GVC => OC

	(1) All	(2) Manuf	(3) All	(4) Manuf	(5) All	(6) Manuf	(7) All	(8) Manuf
Dom Outsourcing (narrow)	-1.655***	-2.529***	-1.260***	-2.186***				
	(0.393)	(0.676)	(0.368)	(0.553)				
Offshoring (narrow)	1.787**	1.238*			1.471**	1.855**		
	(0.833)	(0.657)			(0.724)	(0.786)		
Service Content	0.854*	-0.997					-2.318	2.138
	(0.477)	(1.128)					(1.691)	(1.361)
Log VA/Employees	0.286***	0.211***	0.259***	0.212***	0.255***	0.207***	0.212***	0.228***
	(0.017)	(0.022)	(0.015)	(0.018)	(0.017)	(0.020)	(0.027)	(0.026)
Log Tangible K	0.014*	0.013	0.007	0.017**	0.006	0.016*	-0.002	0.023**
	(0.007)	(0.010)	(0.007)	(0.009)	(0.007)	(0.009)	(0.010)	(0.011)
Inemp	0.747***	0.715***	0.720***	0.715***	0.690***	0.696***	0.656***	0.706***
	(0.026)	(0.034)	(0.025)	(0.033)	(0.025)	(0.033)	(0.043)	(0.039)
Observations	7,218	3,596	7,218	3,596	6,794	3,446	7,218	3,596
Sargan P-test	0.502	0.506	0.408	0.340	0.113	0.312	0.065	0.023
Industry-Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Time FE	YES	YES	YES	YES	YES	YES	YES	YES

Main messages

1. Intangible investments! And not only R&D.
2. Joint determination of investment and production fragmentation choices.
   - KBC investment to exploit returns of fragmentation:
     - absorption of “external” knowledge, adoption & diffusion of technology, generation of new ideas.
   - GVCs as opportunity to stimulate or embed technological advancements.
3. => Design of policies: consider the interplay.

The digitalisation challenge

- New challenges for GVCs from digitalisation:
  - Transformation of goods into services & of investment into purchases of intermediate inputs
  - Production phases disappear; shorter GVCs; Re-shoring.
  - Data rather than goods flows.
- Many aspects of the challenge. One of them: can the measurement infrastructure keep up?

STI ONGOING WORK:
STAY TUNED

GLOBAL FORUM ON PRODUCTIVITY

GVCs

Economics of an Open Internet

GVCs, Skills & Jobs

Digital Economy

KBC

The future of productivity

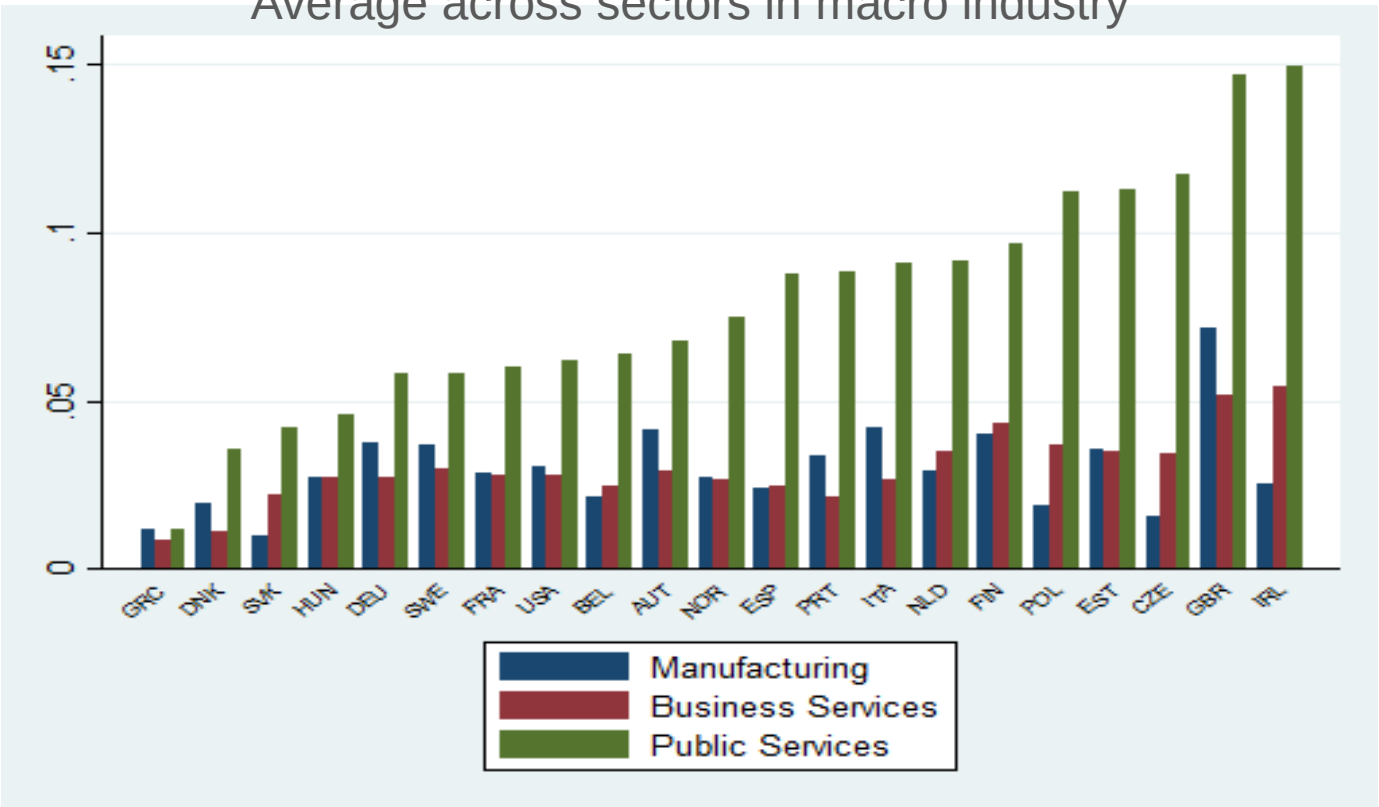
Digitalisation of economy and society

Data-driven Innovation

BACKUP SLIDES

OC “intensity” in public vs business services

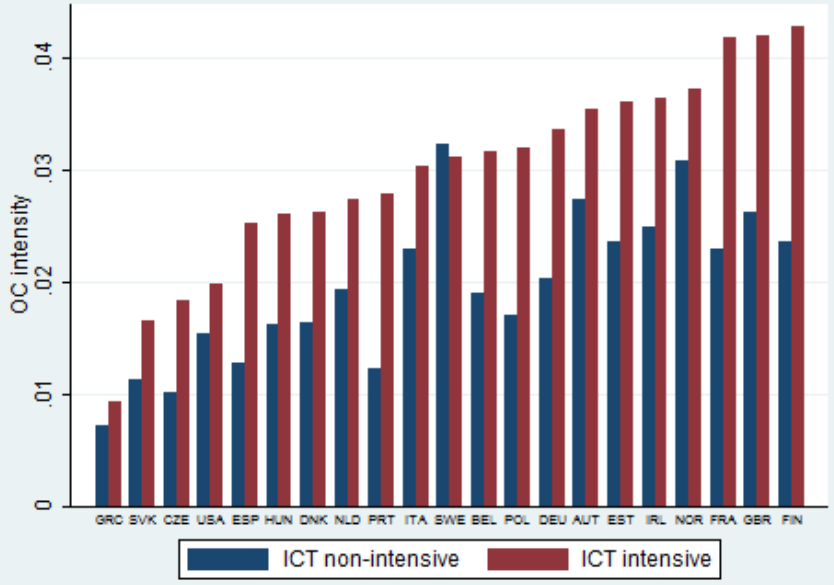
OC investment over adjusted VA (2011).
Average across sectors in macro industry



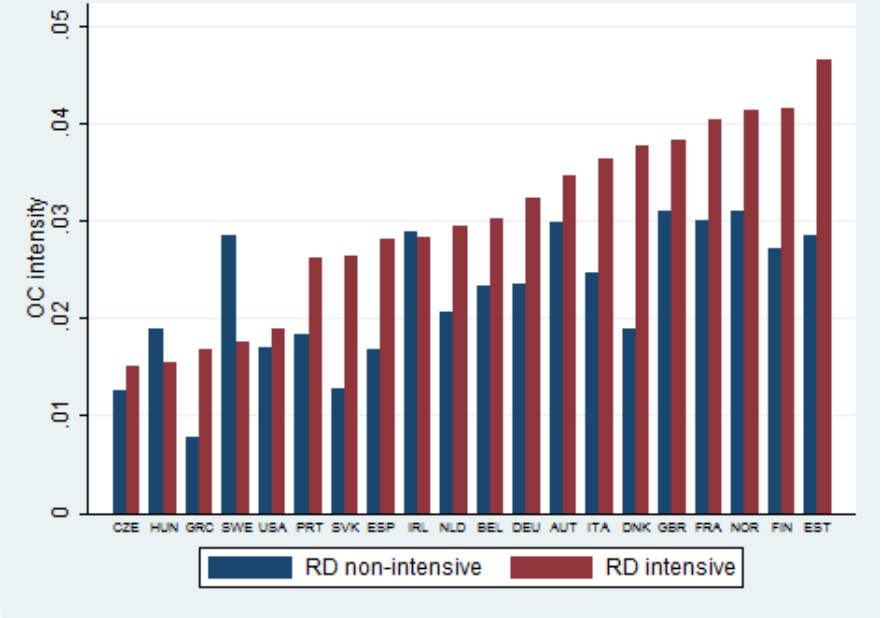
Complementarities (1):

OC investment over VA (2011)

(a) by ICT intensity



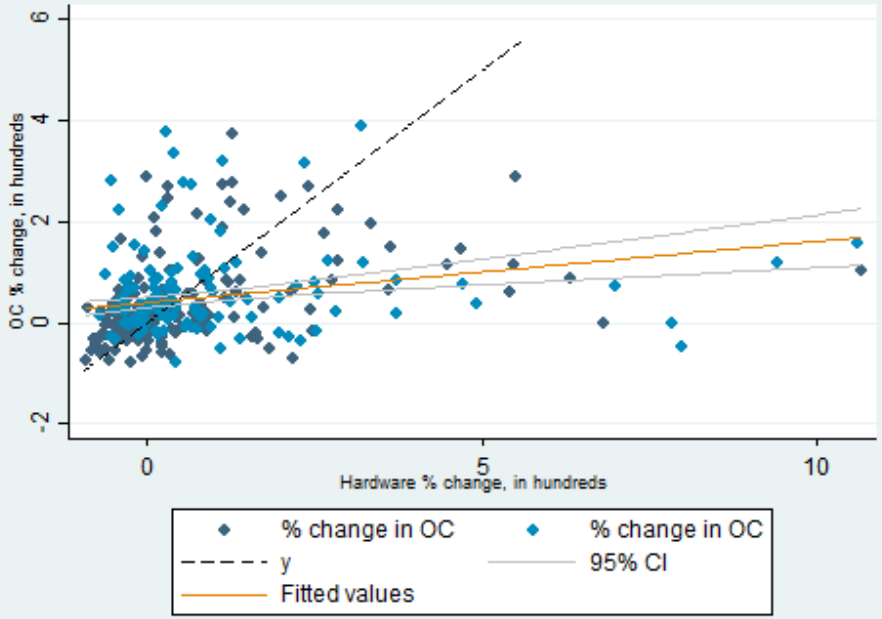
(b) by R&D intensity



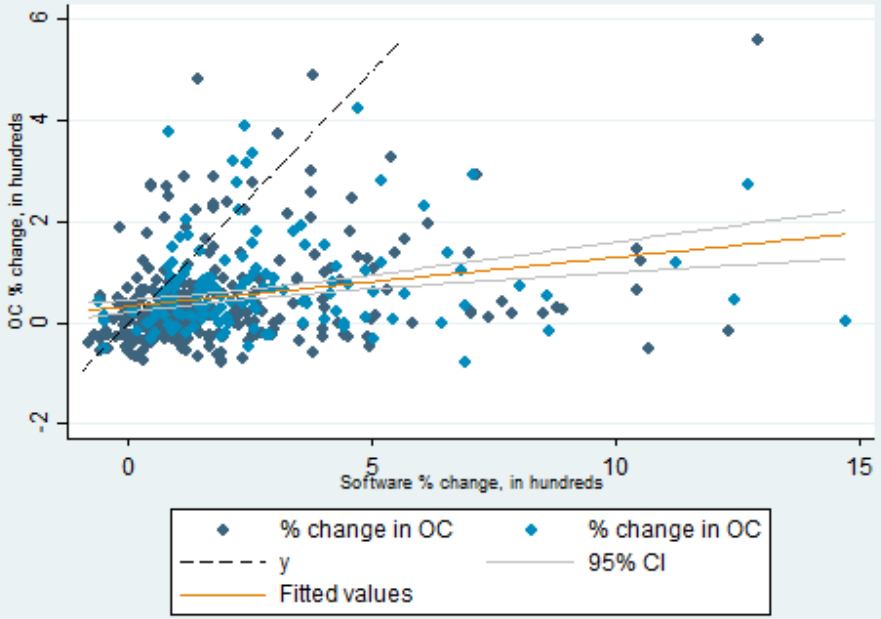
Complementarities (2)

Growth in OC investment and ICT
All sectors (2000-2011)

(a) Hardware



(b) Software & Services



Light blue: services. Dark blue: manufacturing