Organizational capital and global value chain participation: fostering productivity growth in the digital economy

Cecilia Jona-Lasinio
(ISTAT and LUISS University)
Valentina Meliciani
(LUISS University)
Silvia Sopranzetti
(MEF)

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School of Economics and Business Studies – Roma Tre University

Motivation

- Modern economies experienced a prolonged productivity slowdown since the 1960s that accelerated after the financial crisis and has been exacerbated by the COVID19 crisis.

- Also, countries experiencing the slowdown are also increasingly involved in the digital transformation and are actively participating to the globalization of the production activity assumed to generate productivity gains, especially for digital intensive economies (Criscuolo and Timmis, 2017, (2017), Kumritz (2016))

- Digitalization is expected to boost productivity growth enabling innovation and reducing the costs of a range of business processes ((Acemoglu et al. (2014), DeStefano et al. (2018), Van Ark (2016) ,OECD (2018), Brynjolffson et al (2018)).

Motivation

- Digitalization may favor GVC participation reducing transportation and communication costs thus facilitating the coordination of geographically dispersed production activities along the chain and increasing the quality and availability of a wide range of intermediate services (Miroudot and Cadestin, 2017).

- There are likely several factors affecting the linkages between GVC participation and productivity, some of which may be country and industry specific.

- Among them different intangible assets may contribute to appropriating the benefits from GVC participation (particularly R&D and design at the upstream and marketing and advertising at the downstream of the smiling curve; see Jona Lasinio and Meliciani, 2019)

What are intangibles?

Table 2. Intangible Capital: Broad categories and types of investment

Digitized information	•Software •Databases Currently included in GDP
Innovative property	•R&D •Mineral exploration •Artistic, entertainment, and literary originals •Attributed designs (industrial) •Financial product development
Economic competencies	•Market research and branding •Operating models, platforms, supply chains, and distribution networks •Employer-provided training

Source: Corrado, Hulten, and Sichel (2005, 2009).

Organizational capital

- What is organizational capital?
  - Organizational capital is a firm-specific capital good jointly produced with output and embodied in the organization itself (Atkeson and Kehoe, 2005; Corrado, Hulten and Sichel, 2005).
  - The asset is viewed as distinct from other forms of knowledge held by a business organization (e.g., its patent portfolio) (Bresnahan, Brynjolfsson and Hitt, 2002).
- Why it is a relevant driver of productivity growth?
  - Several studies providing empirical evidence of its positive impact on productivity at firms, industry and country levels (Black and Linch 2001, Niebel et al 2016, van Ark et al 2009).

Organizational capital and GVC

- Organizational capital is strategic in managing global value chains as international fragmentation of production requires the coordination of the various stages of production which are spatially dispersed (Baldwin 2016).

- To realize the matching of production teams and ideas, GVC integration requires **managerial capabilities** and a dense circulation of information flows to communicate specifications, standards, technical know-how in addition to costs and other items (Gereffi et al. 2005).

- The efficient organization of production in GVCs is thus mostly based on investments in managerial capabilities (Durand and Milberg 2018).

Research questions

- Our main assumption is that gains from participation depend on the extent of investment in **organizational capital** and **sectoral digitalization**.
- The adoption of information technologies (IT) requires changes in firms' organisation (Brynjolfsson and Hitt, 2000), and that it induces higher productivity gains in better-managed firms (Garicano and Heaton 2010, Bloom et al. 2012), because **management practices and IT are complements.**

➢ Does higher investment in organizational capital **magnifies** the productivity gains from backward participation in GVC?

➢ Does the complementarity between organizational capital and IT matter to explain *potentially* larger productivity gains from participation in high digital industries?

Data

Coverage:

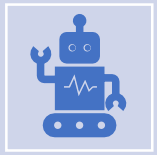
- Time: Annual data from 2000 to 2014
- Geography: 11 European countries and US
- Industry: 16 NACE Rev.2 sectors

Data Sources:

- WIOD (GVC indicators)
- INTAN-Invest (Intangible assets)
- EUKLEMS (Growth and productivity accounts)

A taxonomy of digital sectors

The OECD Digital Taxonomy ranks sectors by their degree of digital intensity over the period 2001-2015 across five dimensions:



1) tangible and intangible ICT investment, 2) purchases of intermediate ICT goods and services, 3) use of robots, 4) proportion of ICT specialists, 5) share of online sales.

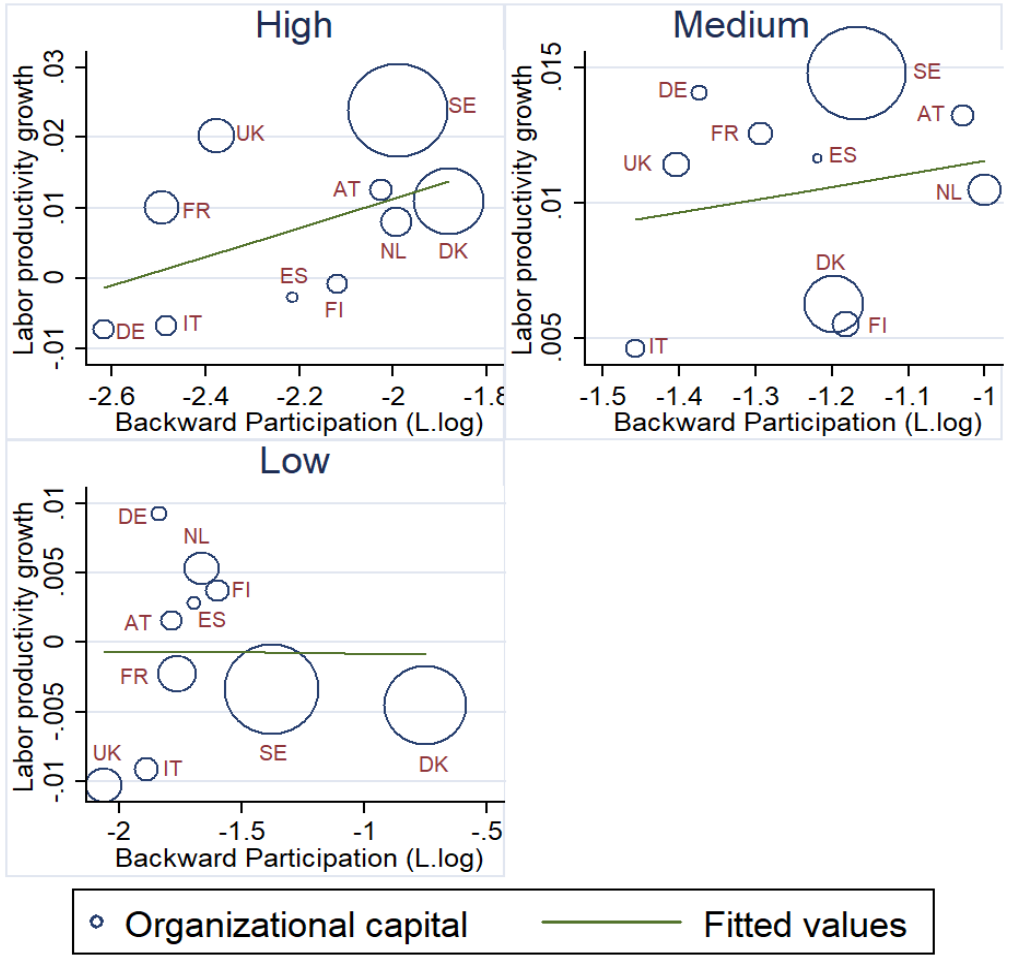
We adjust the OECD classification to NACE

Sector	Intensity
Mining and Quarrying	Low
Manufacturing	Medium
Electricity, Gas, Steam and Air Conditioning Supply	Low
Water Supply; Sewerage, Waste Management and Remediation Activities	Low
Construction	Low
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	Medium
Transportation and Storage	Low
Accommodation and Food Service Activities	Low
Information and Communication	High
Financial and Insurance Activities	High
Professional, Scientific and Technical Activities	High
Administrative and Support Service Activities	Medium
Public Administration and Defence; Compulsory Social Security	Medium
Education	Medium
Human Health and Social Work Activities	Medium
Arts, Entertainment and Recreation	Medium

Source: Berlinghieri et al. (2018)

Labour Productivity and Backward participation in the digital sectors

- Correlation between productivity and backward participation growth is significantly positive in the high and medium digital sector while, in the low digital there is no signal of a clear correlation.
- Countries with the faster productivity growth and GVC participation also show highest organizational capital intensity in the high digital sector while, this relation is less straightforward in medium and low digital intensive sectors.



Econometric specification

Augmented production function:

$$\Delta \ln(Y/H)_{i,c,t} = \alpha_1 \Delta \ln(K^J/H)_{i,c,t} + \alpha_2 \Delta \ln(K^I/H)_{i,c,t} + \alpha_3 \ln(P_{gvc})_{i,c,t-2} + \alpha_4 \ln(K^{org}/H)_{i,c} + \alpha_5 \ln(P_{gvc})_{i,c,t-2} * \ln(K^{org}/H)_{i,c} + \lambda_i + \lambda_t + \eta_{i,c,t}.$$

where c represents country, i industry and t time. Y denotes value added adjusted to include intangible capital, H is total hours worked, K^J is for J=ICT, NonICT capital, K^I is for I=Total intangible, Brand, Training, Design and R&D, P_{gvc} is backward participation and $\ln(K^{org}/H)_{i,c}$ denotes country-industry's average (log) intangible intensity, and λ_i , λ_t are industry and time dummies.

- Estimation methods: Generalized Least Squares and Instrumental Variables.
- GVC participation is instrumented building a set of instruments following Kummritz (2016).

Empirical results: benchmark estimates

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	All sample			All sample		
	Total Intangibles			Intang Excl R&D		
DlnKH_intan	0.155***	0.154***	0.245*			
	(8.071)	(8.018)	(1.655)			
DlnKH_intan_xrd				0.142***	0.139***	0.210***
				(6.860)	(6.777)	(2.890)
lnKH_og_avg	**0.002****	**0.008*****	**0.070****	0.002	**0.008****	**0.067****
	(2.095)	**(2.591)**	**(1.988)**	(1.567)	**(2.372)**	**(2.447)**
ln_backp (t-1)	0.003	**0.020****	**0.160***	0.004	**0.021****	**0.165****
	(1.299)	**(2.413)**	**(1.876)**	(1.566)	**(2.460)**	**(2.197)**
lnKH_og_avg*ln_bck(t-1)		**0.003****	**0.030***		**0.003****	**0.030****
		(2.112)	**(1.902)**		**(2.080)**	**(2.376)**
Observations	1,507	1,507	1,440	1,374	1,374	1350
R-squared			0.080			0.074
Number of ctrysec	126	126		115	115	
Year and Ind FE	gls		IV	gls		IV

z-statistics in parentheses

***** p<0.01, ** p<0.05, * p<0.1**

Empirical results: testing sectoral characteristics

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Intangibles excl R&D					
	tot services		High digital	Low digital	High digital	Low digital
DlnKH_intan_xrd	0.156***	0.155***	0.249***	0.091***	0.250***	-0.041
	(7.782)	(7.713)	(7.982)	(3.189)	(3.184)	(-0.280)
lnKH_og_avg	0.001	0.006	**0.024*** **	0.000		
	(0.897)	(1.528)	**(3.234)**	(0.091)		
lnKH_og_avg (t-1)					**0.038*** **	0.007
					(3.627)	(0.806)
ln_backp (t-1)	**0.004***	**0.017***	**0.052*** **	0.011	**0.083*** **	0.030
	(1.896)	**(1.860)**	**(3.069)**	(0.761)	**(3.215)**	(1.082)
lnKH_og_avg*ln_bck(t-1)		0.002	**0.009*** **	0.001		
		(1.414)	**(2.997)**	(0.314)		
lnKH_og_avg*ln_bck(t-2)					**0.014*** **	0.003
					(3.090)	(0.821)
Observations	1,278	1,278	624	654	610	637
Number of ctrysec	107	107	52	55	0.284	0.040
Year and Ind FE	gls				IV	

z-statistics in parentheses

***** p<0.01, ** p<0.05, * p<0.1**

Main findings

- Our findings show:
  - a) a positive and statistically significant productivity impact of backward participation;
  - b) a larger marginal effect of backward participation on productivity growth in countries-industries with a higher intensity of organizational capital;
  - c) relevance of managerial capabilities to extract value from participation in global value chains, particularly in high digital intensive sectors.

- Our main findings support the existence of a significant impact of backward participation in GVCs on productivity growth which varies according to investment in organizational capital and the digital intensity of the sector.
- Thus, the gains from GVC participation can be **highly asymmetric** between countries and sectors depending on investment in ***organizational capital*** and the extent of sectoral digitalization.
- Policy suggestion: in a context of scarce resources, prioritizing policy actions on sectors most likely to benefit (high digital intensive) might be a good policy strategy to generate larger gains for the economy as a whole.

Back up slides