

Business intangibles in global value chains: In search of export competitive advantage

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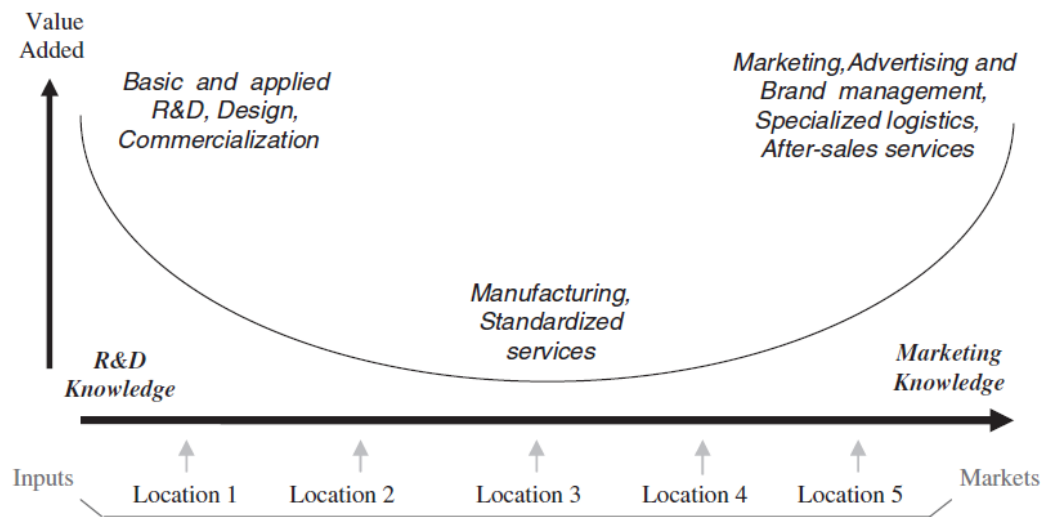
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A brief note on intangibles

- The name **intangibles** is in fact an **umbrella term** that encompasses **non-physical** and **non-financial assets** that in most cases are too difficult to be examined and measured correctly (Lampel et al., 2020).
- Corrado et al. (2009) provided a framework for the identification and classification of business intangibles into three wider categories:
 - Computerized information (computer software, databases and related ICT activities).
 - Innovative property (research, and development (R&D) output, patents and other IPPs).
 - Economic competencies (organizational capital, product design, branding, marketing).
- **Common characteristic:** they allow a firm to **generate value** through proper utilization (Lampel et al., 2020).

Intangible assets in global value chains

The *smiling curve*



Source: Mudambi, 2008

- Intangible assets are related with growth and dominant positioning in GVCs (Mudambi, 2008; Corrado et al., 2009; Niebel et al., 2017).
- Intangibles are the key drivers of the unequal value appropriation along the value chain:
 - Technological asymmetry between different economies (developed vs. developing).
 - The concept of the U-shaped *smiling curve* (Mudambi, 2008).
 - The prominent role of **services** and **knowledge assets**, i.e., **intangibles** (OECD, 2018).
 - The **stagnation** of **manufacturing industries** in the middle end.
 - The ongoing *servicification* as a response – also related with the digital transformation (Miroudot and Cadestin, 2017).

But what about the production of intangibles?

- Who produces the intangibles in global markets and who uses them?
- Is local production preferable due to geographical and **technological proximity**?
- Does this **technological proximity** result into **competitiveness gains**?
- Do global leaders rely on **local knowledge producers** to secure their position in GVCs?

Why focus on location?

- Firm level evidence suggest that *intellectual monopolies* are formulated based on the **accumulation and control of key intangibles** (Durand and Milberg, 2020).
- Macro level: the discussion between *headquarters* (knowledge and technology intensive) and *factories* (labor intensive) by Baldwin and Lopez-Gonzalez (2015).
- Technology asymmetry traverses to manufacturing activities as well → increased **knowledge content** in global **manufacturing supply chains** (Baldwin and Evenett, 2015).
- Del Petre and Rungi (2017) provided firm-level evidence (4000 firms, global scale, including EU, USA and Eastern Asia) that **dominant manufacturing firms** tend to **integrate proximate stages** into their **value chain**.
- Two types of proximity:
 - ❖ Purely geographical
 - ❖ **Technological** (most common)
- Timmer et al. (2014; 2019) argue that **firms** located in **developed economies** outsource unskilled labor abroad and **retain knowledge intensive strategic activities** at home.
- **Dominant manufacturing firms** keep **adjacent** (in terms of technology) **activities close** and outsource dissimilar activities abroad.
 - ❖ **Knowledge intensive manufacturing** industries prefer **domestic knowledge inputs**.

The scope of this study

- This study aims to explore the **contribution of intangibles and GVC participation to competitiveness** for the **manufacturing industries** of the **G7 economies**.
- Special focus: On the **location of production** of intangibles (the **origin** dimension).
- **Main research hypothesis**: Domestic intangibles' utilization positively contributes to competitiveness due to technological proximity of the knowledge producers.
- Two competitiveness indicators:
 - Adjusted revealed comparative advantage (exports oriented).
 - Labor productivity for robustness analysis.

Methodology breakdown

- To account of the origin dimension, we turn to the GLOBALINTO I-O Intangibles database (GIOD)*.
- We expand the database to account for the global G7 economies (Canada, Japan, the USA and some preliminary descriptives for Brazil, China and Rep. of Korea).
- We use two specifications:
 - **Export competitiveness** approach
 - Traditional **labor productivity approach** for robustness checks
- **Data sources:** GIOID and the World Input-Output Database (WIOD) (Timmer et al., 2015).
- **Sector coverage:** 18 NACE Rev. 2 2-digit manufacturing sectors from Canada, France, Germany, Italy, Japan, the UK and the USA.
- **Time frame:** 2000-2014.

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G7 manufacturing sectors covered in the analysis

Sector Acronym	Detailed description
C10-C12	Mn. of food products, beverages and tobacco products
C13-C15	Mn. of textiles, wearing apparel and leather products
C16	Mn. of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
C17	Mn. of paper and paper products
C18	Printing and reproduction of recorded media
C19	Mn. of coke and refined petroleum products
C20	Mn. of chemicals and chemical products
C21	Mn. of basic pharmaceutical products and pharmaceutical preparations
C22	Mn. of rubber and plastic products
C23	Mn. of other non-metallic mineral products
C24	Mn. of basic metals
C25	Mn. of fabricated metal products, except machinery and equipment
C26	Mn. of computer, electronic and optical products
C27	Mn. of electrical equipment
C28	Mn. of machinery and equipment n.e.c.
C29	Mn. of motor vehicles, trailers and semi-trailers
C30	Mn. of other transport equipment
C31_C32	Mn. of furniture; other manufacturing

A traditional production function approach

- We consider a production function that expresses VA as a function of labor ($L_{i,c,t}$), capital ($K_{i,c,t}$) and technology ($A_{i,c,t}$):

$$VA_{i,c,t} = f(A_{i,c,t}K_{i,c,t}L_{i,c,t})$$

- We consider $A_{i,c,t}$ as a function of **exogenous technological factors** (notated as $\tau_1, \tau_2, \dots, \tau_j$).
- Technological factors include:
 - **Intangible inputs** based on their nature as knowledge factors of production,
 - $gvc_b_{i,c}$ and $tradeo_{i,c}$ lagged by one period, in line with Constantinescu et al. (2019) and under the assumption that **knowledge and technology transfer between industries is integrated in their trading transactions, especially** in the case of **GVC trade**.
- Dividing by labor (i.e., hours worked)* and taking logs, we have the benchmark specification:

$$\ln (prod)_{i,c,t} = a_0 + a_1 \ln (t_intan_h)_{i,c,t} + a_2 \ln (gvc_b_h)_{i,c,t-1} + a_3 \ln (tradeo_h)_{i,c,t-1} + a_4 \ln (k_h)_{i,c,t} + \lambda_c + \lambda_t + \varepsilon_{i,t}$$

*Intangible inputs, GVC participation and trade openness are also included in the specification divided per hours worked in order to provide robust and comparable results with the traditional elements of the growth accounting model.

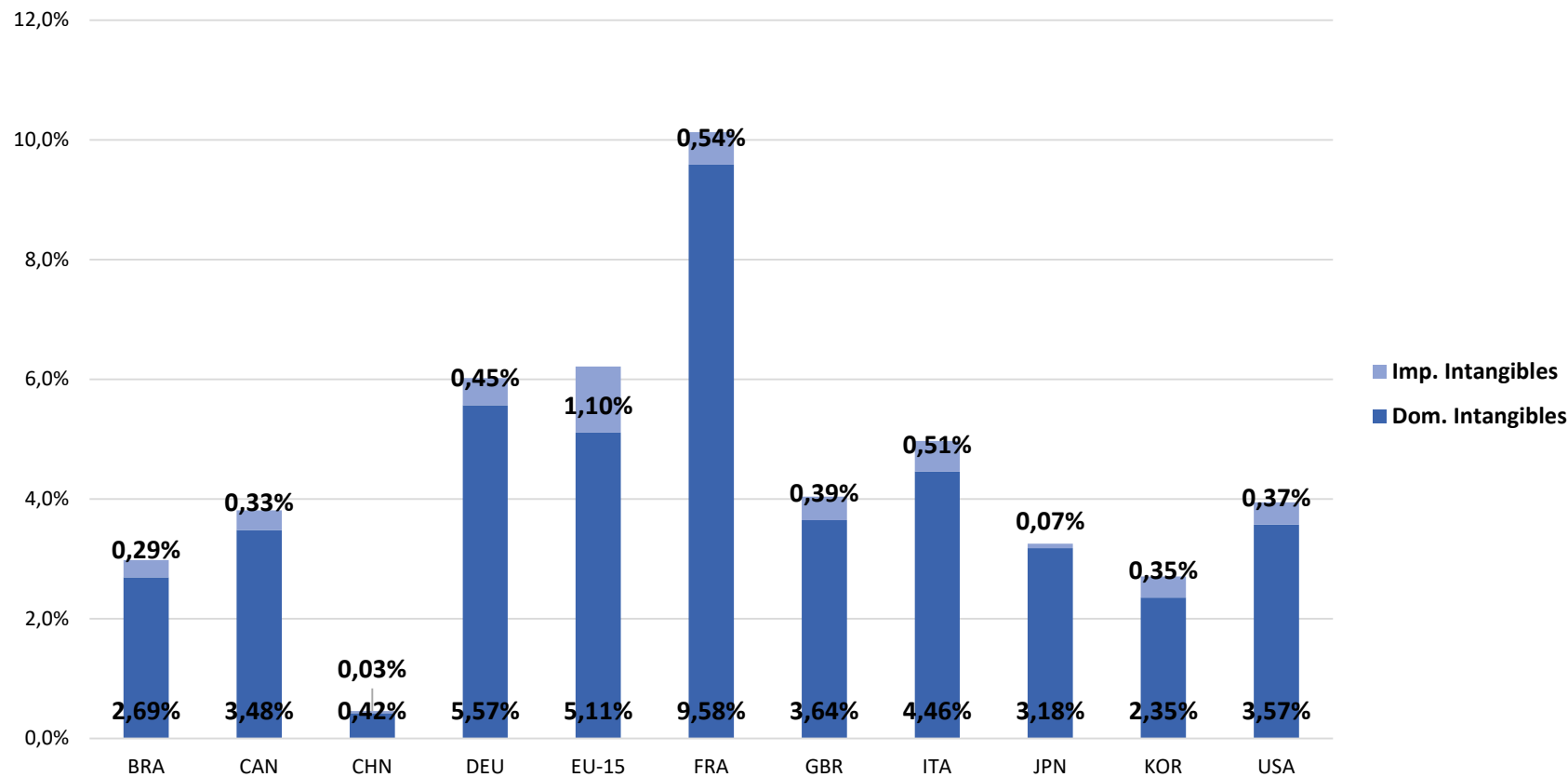
Estimation strategy

- Both specifications are sensitive to endogeneity problems due to the nature of the construction of the variables (especially trade and GVC participation indicators).
- Possible reverse causality in both specifications
- Remedy actions:
 1. Lagged terms for reverse causality-sensitive variables.
 2. Two-step system GMM estimators* (also accounting for autocorrelation and heteroskedasticity)

***Two-step difference GMM estimators** were also tested but system GMM estimators were selected based on their improved efficiency and Bond's (2001) rule of thumb. Additional regressions using **pooled OLS**, and **fixed effects** estimators also provided for robustness checks.

Some descriptive statistics on a global scale (intensity)

Intangibles' intensity (per origin) for the aggregate manufacturing sectors (2000-2014 average)



- France's manufacturing sector is the most intangible intensive.
- The **G7 economies** appear to rely heavily on **domestic intangible inputs** (most notably Japan) → **knowledge and technology proximity**.
- EU-15 presents the higher share of imported intangibles
 - Diversified sample
 - Evidently driven by economies outside of France, Germany, Italy and the UK.
- Asian economies are quite local.
- China ranks at the bottom hinting at the labor-intensive nature of manufacturing activities (more recent data should probably diverge from that finding).

Econometric results

Export competitiveness

<i>ln(RCA)</i>	Two-step system GMM		
	(1.1)	(1.2)	(1.3)
<i>ln(RCA)_{t-1}</i>	0.944*** (0.019)	0.945*** (0.019)	0.960*** (0.019)
<i>ln(t_intan)</i>	0.035*** (0.011)		
<i>ln(d_intan)</i>		0.033*** (0.010)	
<i>ln(i_intan)</i>			0.022* (0.012)
<i>ln(gvc_b)_{t-1}</i>	0.164*** (0.030)	0.163*** (0.030)	0.120*** (0.031)
<i>ln(tradeo)_{t-1}</i>	-0.143*** (0.026)	-0.143*** (0.026)	-0.109*** (0.024)
<i>ln(k_h)</i>	-0.007 (0.009)	-0.007 (0.009)	-0.016 (0.011)
constant	0.272** (0.063)	0.268*** (0.061)	0.283** (0.085)
Time fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Observations	1764	1764	1764
No. of groups	126	126	126
F-test (model)	554.39***	550.73***	744.63***
No. of instruments	78	78	78
Arellano-Bond AR(2) test (p-value)	0.276	0.275	0.280
Hansen's J test (p-value)	0.288	0.288	0.205

Labor productivity

<i>ln(prod)</i>	Two-step system GMM		
	(1.4)	(1.5)	(1.6)
<i>ln(t_intan_h)</i>	0.223*** (0.031)		
<i>ln(d_intan_h)</i>		0.216*** (0.031)	
<i>ln(i_intan_h)</i>			0.067*** (0.018)
<i>ln(gvc_b_h)_{t-1}</i>	-0.082*** (0.024)	-0.085*** (0.024)	-0.105*** (0.023)
<i>ln(tradeo_h)_{t-1}</i>	0.219*** (0.040)	0.220*** (0.13)	0.234*** (0.037)
<i>ln(k_h)</i>	0.323*** (0.058)	0.331*** (0.057)	0.530*** (0.053)
constant	1.651*** (0.133)	1.650*** (0.134)	1.445*** (0.150)
Time fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Observations	1764	1764	1764
No. of groups	126	126	126
F-test (model, p-value)	8058.49***	7943.62***	7565.03***
No. of instruments	64	64	64
Arellano-Bond AR(2) test (p-value)	0.101	0.102	0.119
Hansen's J test (p-value)	0.003	0.003	0.001

Main findings

- Intangible inputs – both **domestic** and **imported** – are identified as major drivers for **export performance** and **labor productivity** in the G7 manufacturing sectors → findings in line with the overall contribution of intangibles to growth by relevant literature.
- **Domestic intangibles** appear to have a stronger positive effect on **competitiveness** and **growth** compared to imported → **supporting** the knowledge and technology **proximity hypothesis**.
 - **For export performance**: both in terms of effect and significance.
 - **For labor productivity**: in terms of effect.
- Divergence of the effects of traditional trade vs. trade in global value chains:
 - **For export performance**: **positive contribution** from **GVC trade** → manufacturing industries from the G7 economies benefit more from participation in GVCs rather than traditional trade.
 - **For labor productivity**: **positive contribution** from **traditional trade** → consistent with relevant literature (Amiti and Konings, 2007; de Loecker, 2013).
- **Backward participation in GVCs** has a **negative effect** on **labor productivity** (persistent finding in all our relevant studies).

Discussion and conclusions

- Knowledge inputs provide a positive contribution to growth and competitiveness for dominant economies → aligns with their classification as *headquarter* economies.
- The origin of intangibles does matter → domestic intangibles provide enhanced gains due to knowledge and technological proximity.
- Increased backward integration in the global production network is significant driver for competitiveness **but** different elements (exports vs. value-added) require different approaches.
- The negative effect of backward participation in GVCs to labor productivity is related with the nature of the activities that these industries undertake:
 - ❖ Lower sophistication of imported intermediates (we separate the effect of the imported knowledge content via imported intangibles intensity).
 - ❖ Most of the value '*added*' in the product comes from either domestic suppliers or the industry itself.
 - ❖ Significance of the positioning in the GVC: manufacturing industries from G7 economies could occupy upstream (knowledge intensive) stages in the production chain → oriented towards forward participation (Antr s, 2019; World Bank, 2020).
- **Future research:**
 - Integrate the implications of upstreamness and downstreamness in GVCs (Antr s and Chor, 2017).
 - Revisit export performance using sophistication indicators (including forward participation to GVCs).

Policy implications: The ABCs of GVC-oriented policies (OECD)

- There is a need for a nexus of **trade, investment, industrial and innovation** policies that can **attract and retain intangible capital** in **GVCs**.
- Van Assche (2020) and Miroudot et al. (2021) provide a concept of **three categories of GVC-oriented policies for intangibles** that include:
 - ❖ **Attractiveness** policies that aim to strengthen the appeal of a location (economy) for intangible activities.
 - ❖ **Buzz** policies that intend to internally reinforce the local production and innovation ecosystems.
 - ❖ **Connectedness** policies that aspire to strengthen the connections of the local economy with other foreign partners.

Policy implications: Integrating the empirical results in the framework

- **Attractiveness** implications:

- Motivation for FDI in local knowledge-intensive service enterprises.
- Stable business environment, high-quality institutions, robust and efficient infrastructure → fostering the development of a healthy innovation ecosystem.
- Combined interventions in other policy areas: regulatory systems, intellectual property rights protection, taxation, etc.

- **Buzz** implications:

- Networking policies and strengthening of knowledge linkages between domestic knowledge suppliers and manufacturing sectors.
- Policy frameworks that support the development of new knowledge-intensive ventures.
- Local knowledge capacity should be considered complementary to foreign knowledge.

- **Connectedness** implications:

- Overlap between attractiveness and connectedness when it comes to attracting FDI.
- Frameworks that facilitate trade interactions (both traditional and GVC trade), especially for the case of knowledge production linkages that cross borders.
- Investment in communication infrastructure and the transportation network.

Policy implications: Reorganizing GVCs in the Covid-19 aftermath

- **Attractiveness, buzz, and connectedness** policies will be particularly important in the context of the **economic recovery** after the **Covid-19 pandemic**.
- **Intangibles** are the main drivers of productivity and growth and are expected to be the **key elements** for countries trying to **recover** and/or **upgrade** into better stages than before.
- **Covid-19** already has significant implications in the **reorganization** of **GVCs**, and as firms reassess their **production locations**, these types of **policies** will become quite **relevant** in **attracting** and **maintaining** **intangible-intensive activities**.

Thank you for your attention.

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