Intangible assets and the position of European countries in global value chains

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23 January 2026, PRIN Project Workshop, Rome

Finanziato dall'Unione europea
NextGenerationEU

Ministero dell'Università e della Ricerca

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- Long-standing literature on GVCs (Gereffi et al., 2005), highlighting asymmetries of the distribution of value added and country-industries ability to capture this based on their position or on different functions (Durand and Milberg, 2020; Rikap, 2021; Coveri et al., 2024; Bontadini et al., 2024)

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- The literature has often framed GVC participation in terms of position, using different measures (Mancini et al., 2024; Antràs et al., 2012) that rarely look explicitly at knowledge/technology accumulation

This Paper

⇒ We map the distribution of intangible assets *within* and *across* GVCs to identify country-industries' position in terms of knowledge production for 2000–2019

⇒ We combine data from input-output (OECD ICIO Tables) with intangible capital stock (EU-KLEMS&INTAN-Prod)

⇒ We proceed in two steps:

1. We devise an indicator to identify country-industries' intangible contribution to foreign GVCs (GVCINT).
2. We decompose the GVCINT measure by implementing a Structural Decomposition Analysis and identify the key drivers behind its changes.

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⇒ Persistence in asymmetries in intangible assets, only partially offset by reorganisation of trade flows.

Data and Sample

- *Sample*: 23 European countries and 33 industries between 2000 and 2019
- *Input-Output Tables*: OECD ICIO 2023 Database
- *Intangible assets*: EU-KLEMS&INTAN-Prod 2024 Release
  - Intangible assets include National Account intangibles and Non-National Accounts
  - Capital stocks of intangible assets (at current prices, converted into USD by taking the nominal exchange rate from the OECD)

Measure

We start from the Inter-Country I/O, global income matrix:

$$V'BF' = V'X = V'(I - A)^{-1}F' \tag{1}$$

We replace V' with I', a diagonalised vector of intangible stocks per unit of output (K_Intan/X), and remove domestic linkages to focus on GVCs:

$$I'BF' = \begin{bmatrix} 0 & I_a b_{ab} f_b & I_a b_{ac} f_c \\ I_b b_{ba} f_a & 0 & I_b b_{bc} f_c \\ I_c b_{ca} f_a & I_c b_{cb} f_b & 0 \end{bmatrix}$$

$$GVCINT_{ci} = \underbrace{I'BF' \cdot \text{diag}\left(\frac{1}{\iota' \cdot I'BF'}\right)}_{\text{GVC Intangible share (col share)}} * \underbrace{\text{diag}\left(\frac{1}{V'BF' \cdot \iota}\right) \cdot V'BF'}_{\text{Income weights (row share)}} \tag{2}$$

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- *Own technology*: Country-industry's intangible intensity.

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- *Own trade*: its importance as supplier within a GVC.

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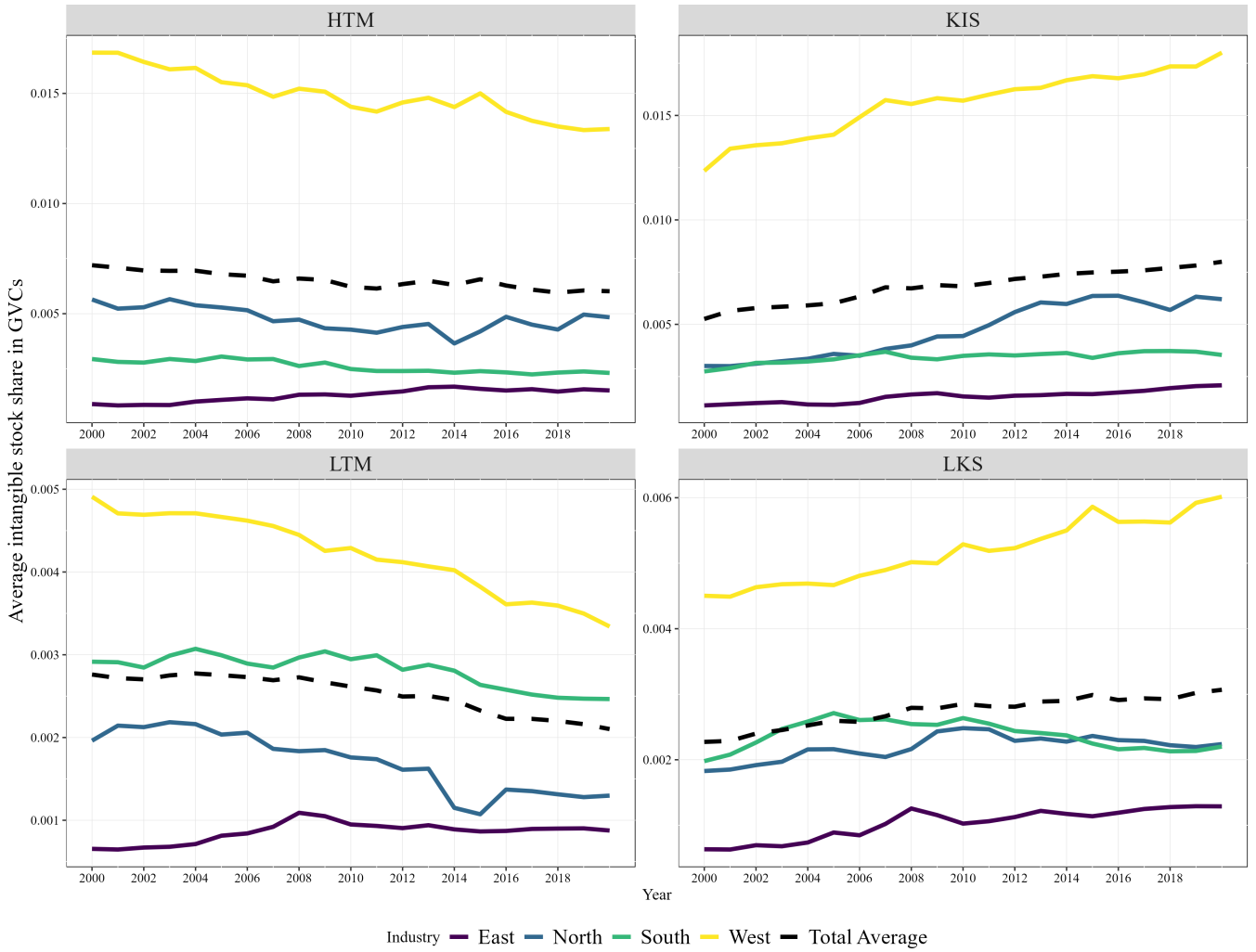
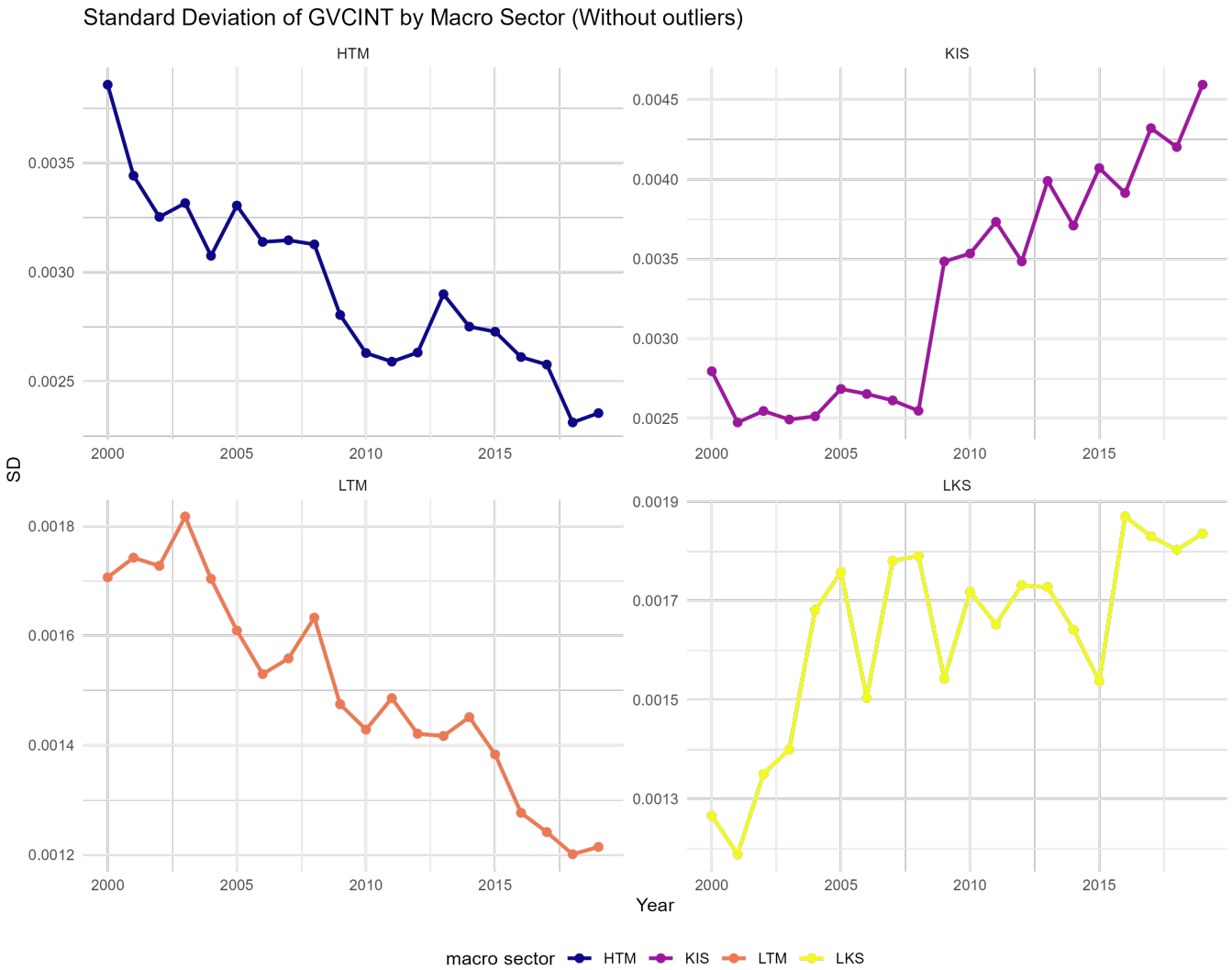
- *Own technology*: Country-industry's intangible intensity.
- *Own trade*: its importance as supplier within a GVC.
- *Relative technology*: the intangible intensity of the GVCs (i.e. other partners) it participates to.
- *Relative trade*: how value added is allocated across GVCs and their importance as buyer for a country-industry.

GVC intangible (GVCINT) average shares by macro sector and region



Asymmetries in country-industries' intangible intensity and GVC linkages



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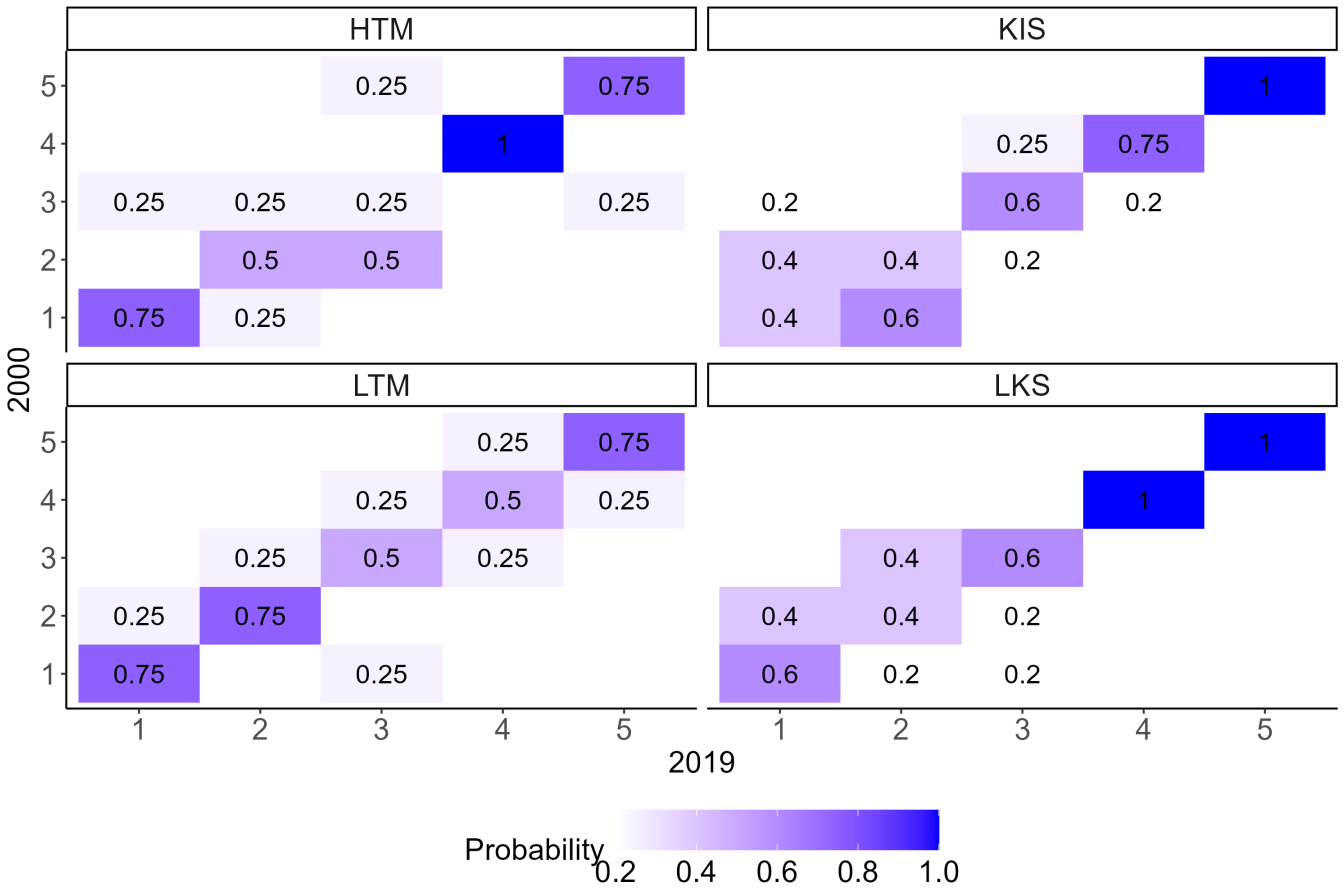


SDA: Components of the change in GVCINT

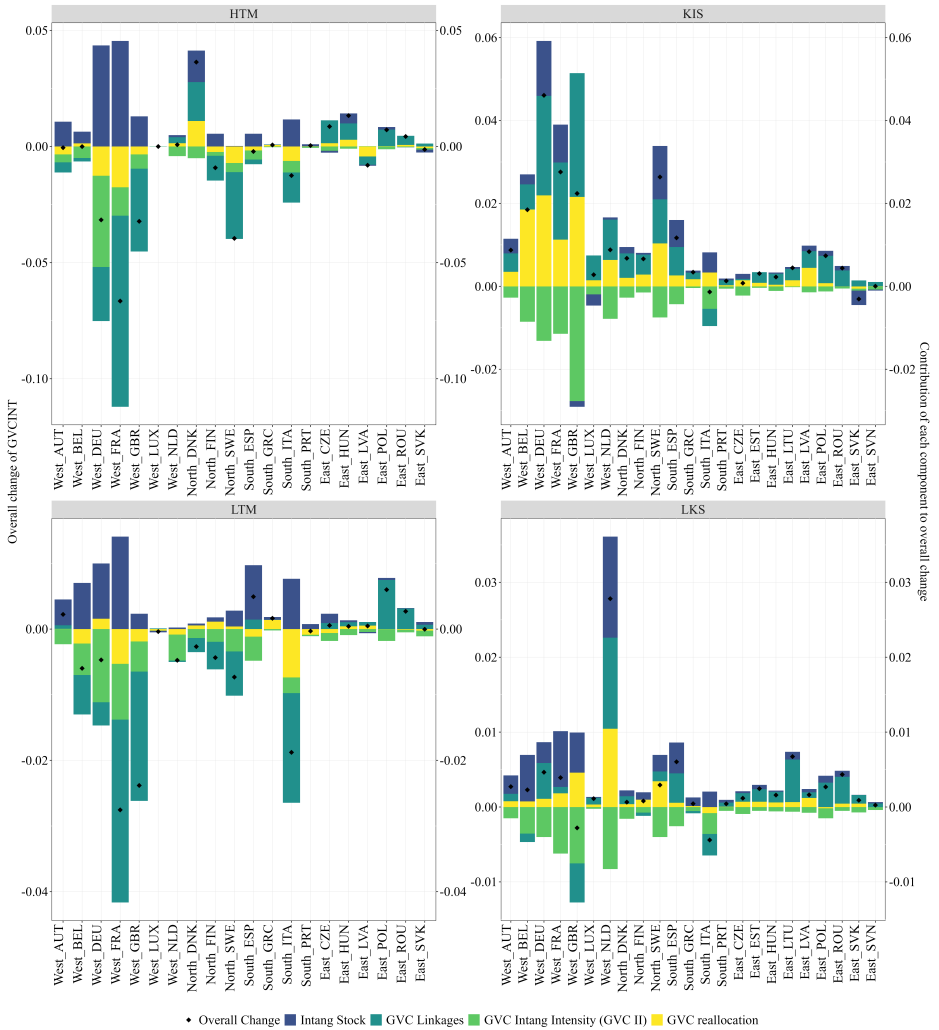
▸ Detailed decomposition

$$
\begin{aligned}
GVCINT &= \underbrace{I'}_{\text{Intang. stock}} \cdot \underbrace{B}_{\text{GVC linkages}} \cdot \underbrace{\text{diag}\left(\frac{1}{\iota' IB}\right)}_{\text{GVC intang. intensity}} \cdot \underbrace{VBF_{sh}}_{\text{GVC reallocation}} \\
&= I \cdot B \cdot Ish \cdot Vsh
\end{aligned} \tag{4}
$$

$$
\begin{aligned}
\Delta GVCINT &= GVCINT^{t1} - GVCINT^{t0} \\
&= \underbrace{0.5\left(\Delta I\, B^{t0}\, Ish^{t0}\, Vsh^{t0} + \Delta I\, B^{t1}\, Ish^{t1}\, Vsh^{t1}\right)}_{\text{Intang. stock}} \\
&\quad + \underbrace{0.5\left(I^{t1}\, \Delta B\, Ish^{t0}\, Vsh^{t0} + I^{t0}\, \Delta B\, Ish^{t1}\, Vsh^{t1}\right)}_{\text{GVC linkages}} \\
&\quad + \underbrace{0.5\left(I^{t1} B^{t1}\, \Delta Ish\, Vsh^{t0} + I^{t0} B^{t0}\, \Delta Ish\, Vsh^{t1}\right)}_{\text{GVC intang. intensity}} \\
&\quad + \underbrace{0.5\left(I^{t1} B^{t1}\, Ish^{t1}\, \Delta Vsh + I^{t0} B^{t0}\, Ish^{t1}\, \Delta Vsh\right)}_{\text{GVC reallocation}}
\end{aligned} \tag{5}
$$

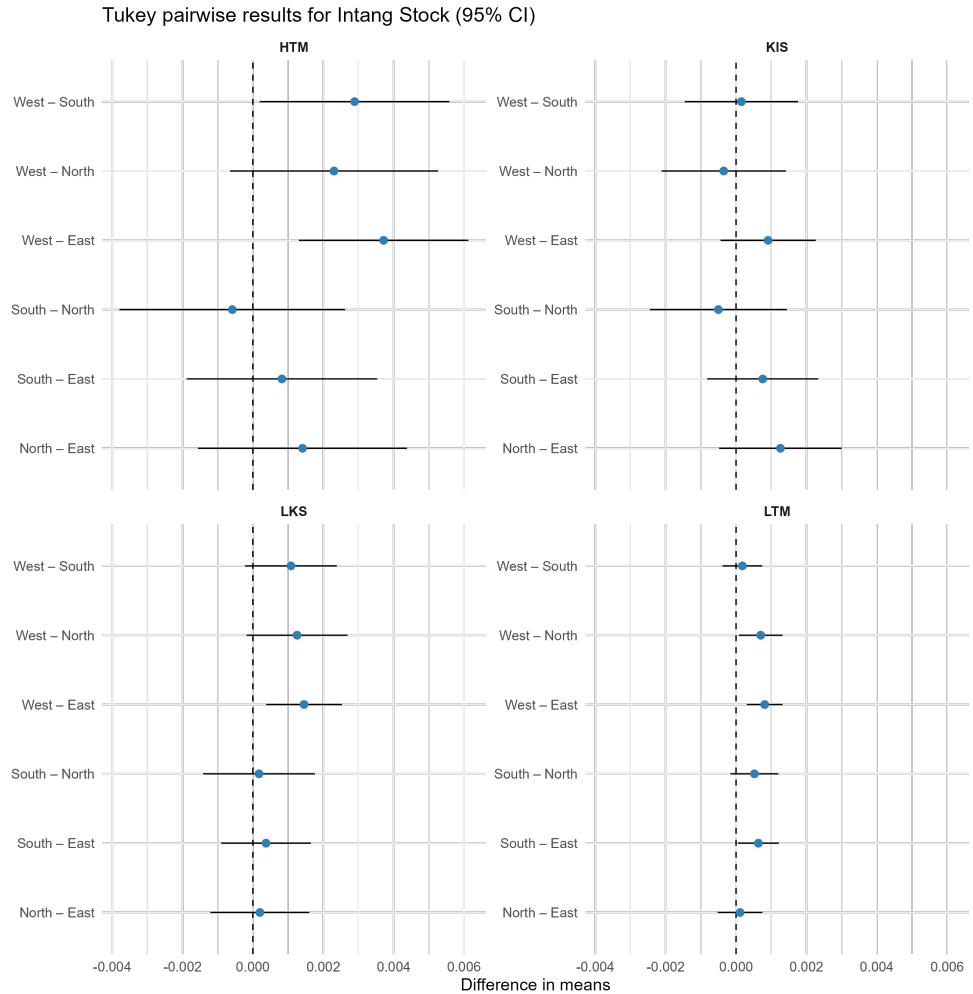
Drivers of GVCINT: Country-industries' intangible intensity and GVC linkages

- In manufacturing GVC linkages have largely had negative contribution to GVC intangible position, except for the East.
- For services both intangible stock and GVC linkages have consolidated the dominance of West and North.
- General increase in intangible intensity of GVCs has had negative contribution to GVC intangible position.
- KIS in West and North have reallocated value added towards less intangible intensive GVCs, while the opposite is true for manufacturing.



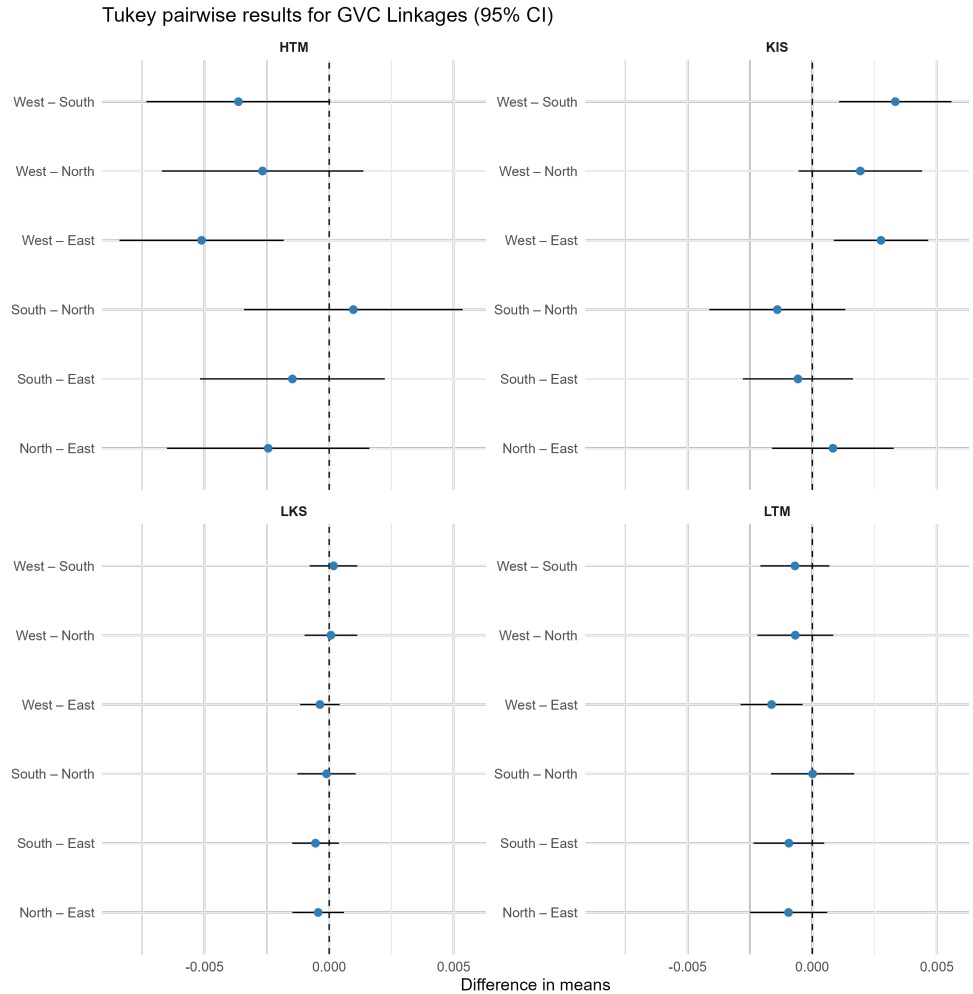
Intangible stock and GVC intangible position across regions and macro-sectors

- Intangible stock has contributed more to Western manufacturing, compared to East.
- Persistent gap in the accumulation of intangible assets between West and East.
- Interestingly, this divide disappears when looking at KIS, the most intangible intensive macro-sector in which intangible accumulation has occurred across regions.



GVC linkages and GVC intangible position across regions and macro-sectors

- For GVC linkages, the West-East divide reverses for manufacturing
- GVC reshuffling of linkages has favoured Eastern countries, more than compensating their sluggish intangible accumulation.
- This is not the case for KIS where GVC linkages have reinforced the dominance of Western countries wrt both Eastern and Southern countries.



Conclusion

- We propose a conceptual and empirical framework to measure and decompose country-industries' position in GVCs.
- We isolate drivers of GVC intangible position, both **trade-** and **technology-based** as well as *own* and *relative*.

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Main Takeaways

1. Europe has experienced a redistribution of trade linkages, but this has not been accompanied by a similar redistribution in knowledge production.
2. Both trade and intangible intensity have been a key driver of changes in GVCINT, but patterns vary across sectors and regions.
3. Eastern countries have improved their GVC positions primarily through trade in manufacturing.
4. Western countries have retained their positions largely thanks to increases in intangible assets in manufacturing and through trade in services.

6 Appendix. Decomposition of GVCINT

Methodology for decomposition

Go back

$$GVCINT_{ci} = \underbrace{I'BF' \cdot \text{diag}\left(\frac{1}{\iota' \cdot I'BF'}\right)}_{\text{GVC Intangible share (col share)}} * \underbrace{\text{diag}\left(\frac{1}{V'BF' \cdot \iota}\right) \cdot V'BF'}_{\text{Income weights (row share)}}$$

Bearing in mind that both I and F are diagonalised vectors that only have one value for each column (and zero everywhere else), the first term of GVCINT can be rewritten as:

$$I'BF' \cdot \text{diag}\left(\frac{1}{\iota' \cdot I'BF'}\right) = I'B \cdot F\,\text{diag}\left(\frac{1}{\iota' \cdot I'BF'}\right) = I'B \cdot \text{diag}\left(\frac{1}{\iota' \cdot I'B}\right)$$

So GVCINT is as follows:

$$GVCINT = \underbrace{I'}_{\text{Intang. stock}} \cdot \underbrace{B}_{\text{GVC linkages}} \cdot \underbrace{\text{diag}\left(\frac{1}{\iota' I'B}\right)}_{\text{GVC intang. intensity}} \cdot \underbrace{V'BF'_{sh}}_{\text{GVC reallocation}}$$

$$= I \cdot B \cdot Ish \cdot Vsh$$

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