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CompNet

Trade and Competitiveness: EU RVC Productivity Transmission

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Motivation

- Competitiveness is again at the center of the policy debate;
- Key report by Mario Draghi on the future of European competitiveness and its challenges (Draghi, 2024);
- "*Because Europe will do "whatever it takes" to keep its competitive edge.*", 2023 State of the Union Address by President von der Leyen;
- Well-functioning Regional Value Chains (RVC) are crucial to a competitive economic system;
- Ensuring that productivity diffuses throughout European RVC achieves two (apparently) conflicting goals:
    - Escalating European competitiveness
    - Furthering convergence within the block

Existing Literature

Bartelsman et al. (2008) pioneered the study of GVC productivity transmission. For UK firms, the productivity impact of the global frontier is less than that of the national frontier. The productivity "pull" of the global frontier decreases with distance of the firm from the global frontier itself.

Within-country productivity diffusion is stronger than cross-country diffusion. New Zealand is not benefiting from the international diffusion of best technologies (Zheng at al., 2021).

Two-stages technology diffusion from Western to Eastern EU countries through GVCs is an import channel of technology transmission. The capacity of Eastern EU countries to absorb productivity spillovers declined after the global financial crisis (Chiacchio et al., 2018).

Higher trade openness allowed recent EU members to reap imported efficiency gains, experiencing technological convergence before the global financial crisis (Martínez Turégano, 2021).

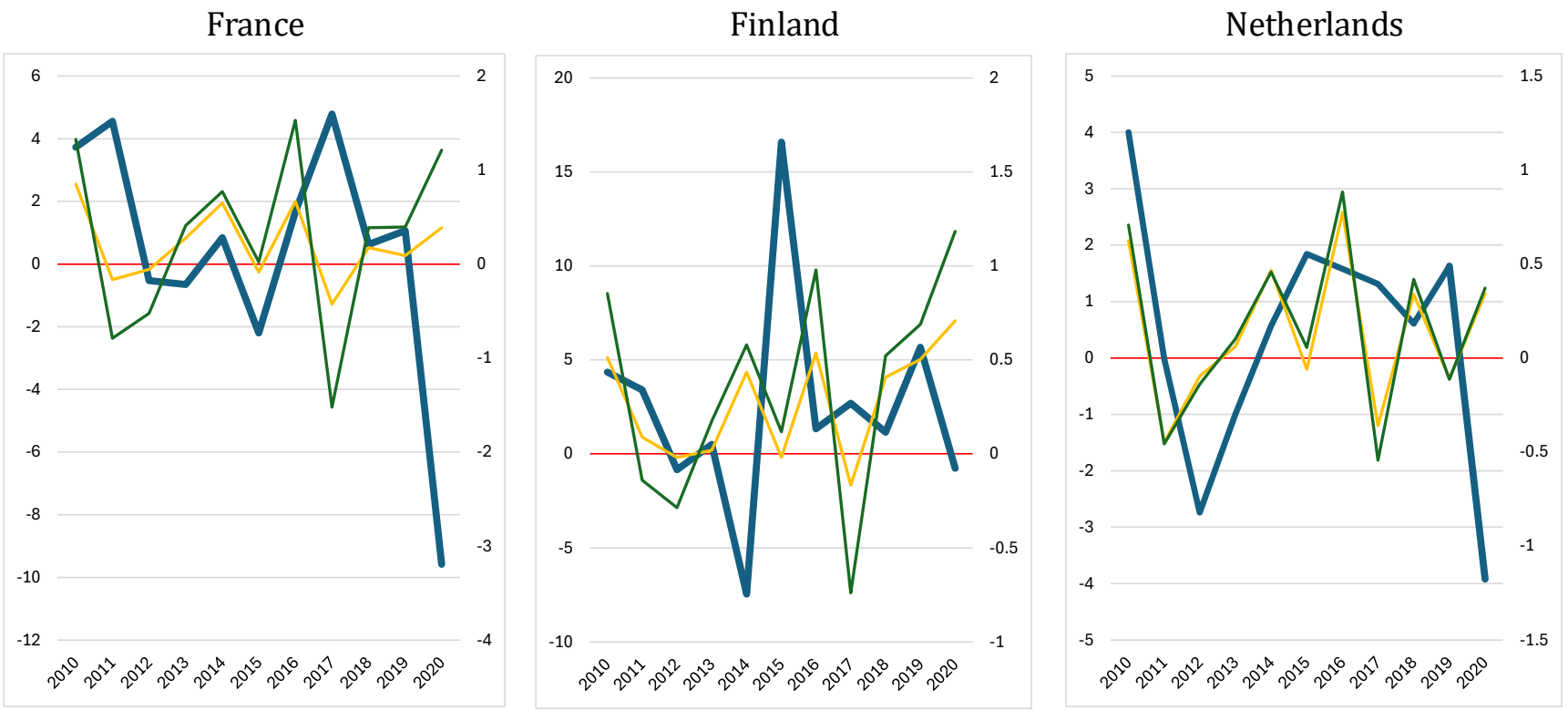
Previous Work

Output:

- CompNet (2023), Firm Productivity Report, July
- Di Mauro, F. & Matani, M. (2023). Talking about competitiveness in Europe: Productivity not protection. VoxEU.org, 29 September

Firm and GVC Productivity

Mean Labor Productivity Growth, 2010-2020



Source: MDI and CompNet 9th Vintage
Note: Figures are yearly averages across firms.

- On average, the co-movements between national firms' and RVC productivity are not straightforward
- What are the nuances of this relationship?
  - ▸ Firm heterogeneity
  - ▸ Changes during crises
  - ▸ Additional firm characteristics

Key Findings

- Productivity diffuses throughout EU RVCs in a 2-stages process
- EU RVCs exhibit limited resilience during crises
- Firm characteristics matter (R&D)
- Firm heterogeneity matters

Framework

- 2-stage diffusion process of technology across countries (Bartelsman et al., 2008)
- Chiacchio et al. (2018): national firms are frontier (top 2 deciles of productivity), laggard (bottom 2 deciles of productivity), or mid-productive (other productivity deciles in between)

1st Stage: From GVC to National Frontier Firms

$$\Delta Prod_{c,s,t}^{nat\ front} = \alpha + \beta_1 \Delta Prod_{c,s,t}^{RVC\ front} + \beta_2 \ln\left(Prod_{c,s,t-1}^{RVC\ front} / Prod_{c,s,t-1}^{nat\ front}\right) + \beta_3 \Delta TradeSh_{c,s,t} + \delta_{c,s} + \tau_t + \varepsilon_{c,s,t}$$

- β_1 → correlation between Lab Prod changes of **national frontier firms** and changes in Lab Prod at the **RVC frontier**
- β_2 → "catch-up" effect: lagged distance of **national frontier firms** from **the RVC frontier** in terms of Lab Prod
- β_3 → GVC participation: **share of trade on turnover** at the macro-sector level
- τ_t are time dummies

2nd Stage: From National Frontier to National Mid-Productive and Laggard Firms

$$\Delta Prod_{c,s,t}^{nat\ other} = \alpha + \beta_1 \Delta Prod_{c,s,t}^{RVC\ front} + \beta_2 \ln\left(Prod_{c,s,t-1}^{RVC\ front} / Prod_{c,s,t-1}^{nat\ other}\right) + \beta_3 \Delta TradeSh_{c,s,t} + \beta_4 \Delta Prod_{c,s,t}^{nat\ front}$$

$$+ \beta_5 \ln\left(Prod_{c,s,t-1}^{nat\ front} / Prod_{c,s,t-1}^{nat\ other}\right) + \delta_{c,s} + \tau_t + \varepsilon_{c,s,t}$$

- β_4 → correlation between Lab Prod changes of **national middle- or low-productive firms** and changes in the Lab Prod of **national frontier firms**
- β_5 → "catch-up" effect: lagged distance of **national middle- or low-productive firms** from **the national frontier** in terms of Lab Prod

Macro Evidence I – 2-Stage Diffusion is at Work

Lab Prod Growth Transmission
European Countries and Macro-Sectors, 2005-2020

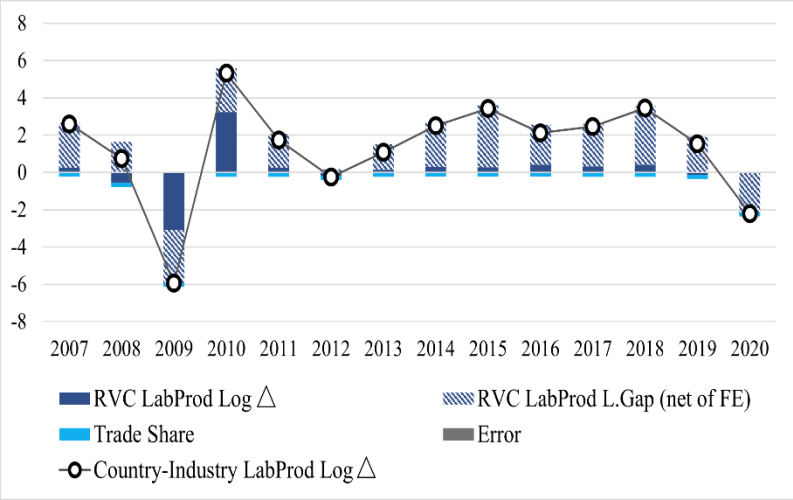
LabProd LogΔ	(1) Frontier, Import	(2) Mid-Productive, Import	(3) Laggard, Import	(4) Frontier, Export	(5) Mid-Productive, Export	(6) Laggard, Export
RVC LabProd LogΔ	0.3135***	0.0927**	0.2028***	0.1911***	0.1079***	0.2510***
	(0.0648)	(0.0393)	(0.0746)	(0.0664)	(0.0396)	(0.0758)
Frontier LabProd LogΔ		0.6645***	0.6775***		0.6688***	0.6888***
		(0.0086)	(0.0160)		(0.0084)	(0.0156)
RVC LabProd L.Gap	0.3068***	0.0465***	0.0545***	0.2335***	0.0378***	0.0346**
	(0.0092)	(0.0063)	(0.0118)	(0.0082)	(0.0053)	(0.0099)
Frontier LabProd L.Gap		0.3877***	0.4776***		0.3940***	0.4958***
		(0.0118)	(0.0160)		(0.0115)	(0.0151)
Trade Share	0.7925*	-0.5410**	-0.2597	1.5215	2.1095	7.1851**
	(0.4427)	(0.2667)	(0.4997)	(3.1730)	(1.9181)	(3.6176)
Observations	6,049	5,904	5,801	6,049	5,904	5,801
Country-Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
R-Squared	0.2426	0.6424	0.4681	0.2054	0.6420	0.4679
Adjusted R-Squared	0.1757	0.6107	0.4206	0.1352	0.6103	0.4204

Source: CompNet 9th Vintage and OECD ICIO
Note: Robust standard errors in parentheses, clustered at the country-sector level. *** p<0.01, ** p<0.05, * p<0.1. In column 1, *Frontier* is the log labor productivity growth of firms that belong to the last two deciles of the labor productivity distribution of each country and macro-sector. In column 2, *Middle* is the log labor productivity growth of mid-productive firms with labor productivity computed like the average labor productivity of firms between the third and the eight deciles of the labor productivity distribution within each country and macro-sector, using employment like weight. In column 3, *Laggard* is the log labor productivity growth of laggard firms that belong to the first two deciles of the labor productivity distribution for each country and macro-sector. Results for trade linkages between BE, CH, CZ, DE, DK, ES, FI, FR, HU, HR, IT, LV, LT, MT, NL, PL, PT, RO, SI, SK, and SE. Unbalanced sample over 2005-2020. The latest available year is 2018 for DE, and 2019 for LV and NL. Country-sector fixed effects are included. Log labor productivity growth rates for the GVC frontier are computed weighting by imports in columns (1)-(3), and by exports in columns (4)-(6).

- Strong Labor Productivity transmission
  - From the RVC frontier to national frontier firms
  - From the national frontier firms to national mid-productive and laggard firms

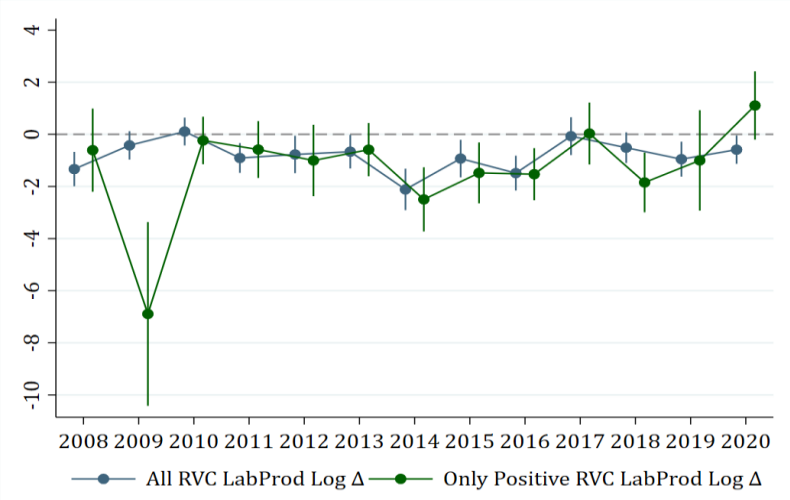
Macro Evidence II – RVCs take a Dip during Crises

Regression-based Productivity Shock Decomposition
Average across European countries and macro-sectors
2007-2020



Source: CompNet 9th Vintage and OECD ICIO.
Note: Figures are yearly averages across countries and macro-sectors weighted by real value added. Results for export linkages between BE, CH, CZ, DE, DK, ES, FI, FR, HR, HU, IT, LT, LV, MT, NL, PL, PT, RO, SI, SK, and SE. Unbalanced sample over 2005-2020. The latest available year is 2018 for DE, and 2019 for LV and NL.

Responsiveness to European RVC Productivity Shocks over Years
European countries and macro-sectors
2008-2020



Source: CompNet 9th Vintage and OECD ICIO.
Note: Figures are coefficients of yearly interactions with GVC labor productivity growth, estimated across countries and macro-sectors. Results for export linkages between BE, CH, CZ, DE, DK, ES, FI, FR, HR, HU, IT, LT, LV, MT, NL, PL, PT, RO, SI, SK, and SE. Unbalanced sample over 2005-2020. The latest available year is 2018 for DE, and 2019 for LV and NL.

- Lab Prod Growth of the EU RVC counterparts impacts the Lab Prod of the overall economy
- Catching up with the RVC frontier is a major driver
- Such impacts are significantly negative at the time of crisis (GFC in 2009 and COVID in 2020): are EU RVCs robust / resilient ?
- Responsiveness to positive shocks held ground during COVID: encouraging sign?

Micro Evidence

From the country-macrosector RVC frontier…

For each country c, macrosector s, and year t:

$$\Delta Prod_{c,s,t}^{RVC\_front\_f} = \sum_{c'} \sum_{s'} \left(\frac{x_{c,s,c',s',t}^{f}}{\sum_{c'} \sum_{s'} x_{c,s,c',s',t}^{f}} \Delta Prod_{c',s',t}^{nat\_front} \right)$$

$x_{c,s,c',s',t}^{f}$ -> amount of flow f (export or import) traded between macro-sector s in country c and macro-sector s' in country c' at time t;

$\Delta Prod_{c',s',t}^{nat\_front}$ -> year-on-year log productivity growth of national frontier firms (the top quintile of the productivity distribution) in partner country c' and macro-sector s' in year t.

…to the firm RVC frontier

For each firm i and year t:

$$\Delta Prod_{i,t}^{RVC\_front\_f} = \sum_{c'} \left(\frac{x_{i,c',t}^{f}}{\sum_{c'} x_{i,c',t}^{f}} \Delta Prod_{c',t}^{nat\_front} \right)$$

$x_{i,c',t}^{f}$ -> amount of flow f (export, import, or total trade) traded between firm i and country c' at time t;

$\Delta Prod_{c',t}^{nat\_front}$ -> year-on-year log productivity growth of national frontier firms (the top quintile of the productivity distribution) in partner country c' in year t.

Gain: Firm-level analysis; **Loss**: No sectoral detail (no firm-level IO tables)

Micro Evidence

Baseline specification

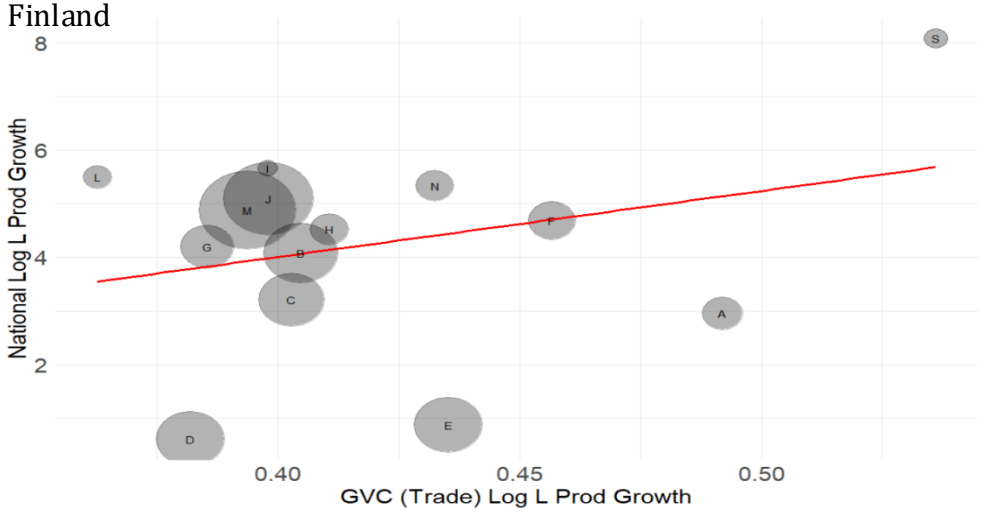
$$\Delta Prod_{i,t} = \beta_1 \Delta Prod_{i,t}^{RVC\_front} + \beta_2 \ln\left(Prod_{i,t-1}^{RVC\_front} / Prod_{i,t-1}\right) + \delta_i + \tau_t + \varepsilon_{i,t}$$

- $\Delta Prod_{i,t} = \ln\left(Prod_{i,t} / Prod_{i,t-1}\right)$: Year-on-year log change in labor productivity of firm *i*
- $\Delta Prod_{i,t}^{RVC\_front}$: Year-on-year log change in labor productivity of the GVC frontier of firm *i*
- $\ln\left(Prod_{i,t-1}^{RVC\_front} / Prod_{i,t-1}\right)$: Lagged gap in labor productivity between firm *i* and its RVC frontier, measures the Catch up Effect
- δ_i is firm FE
- τ_t is year FE
- Productivity measures for 21 European partner countries are sourced from CompNet
- Robustness checks with alternative productivity measures (TFP, Solow residuals)

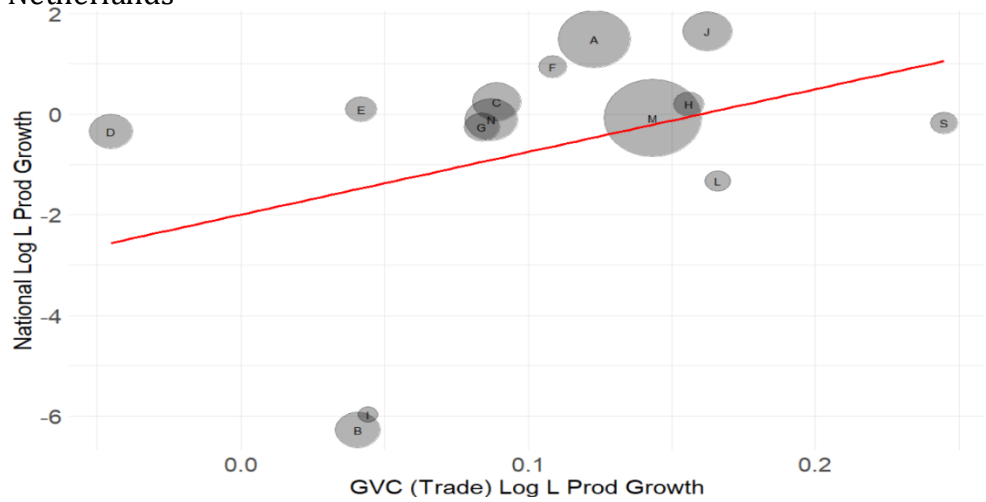
Micro Evidence I – R&D

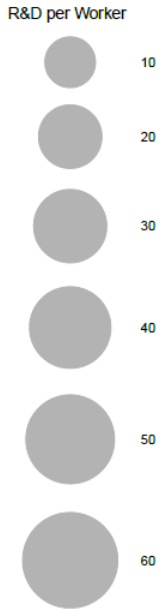
Mean National Productivity Growth, RVC Productivity Growth, and R&D Intensity
Macro-sectors, Average 2011-2022

Finland



Netherlands





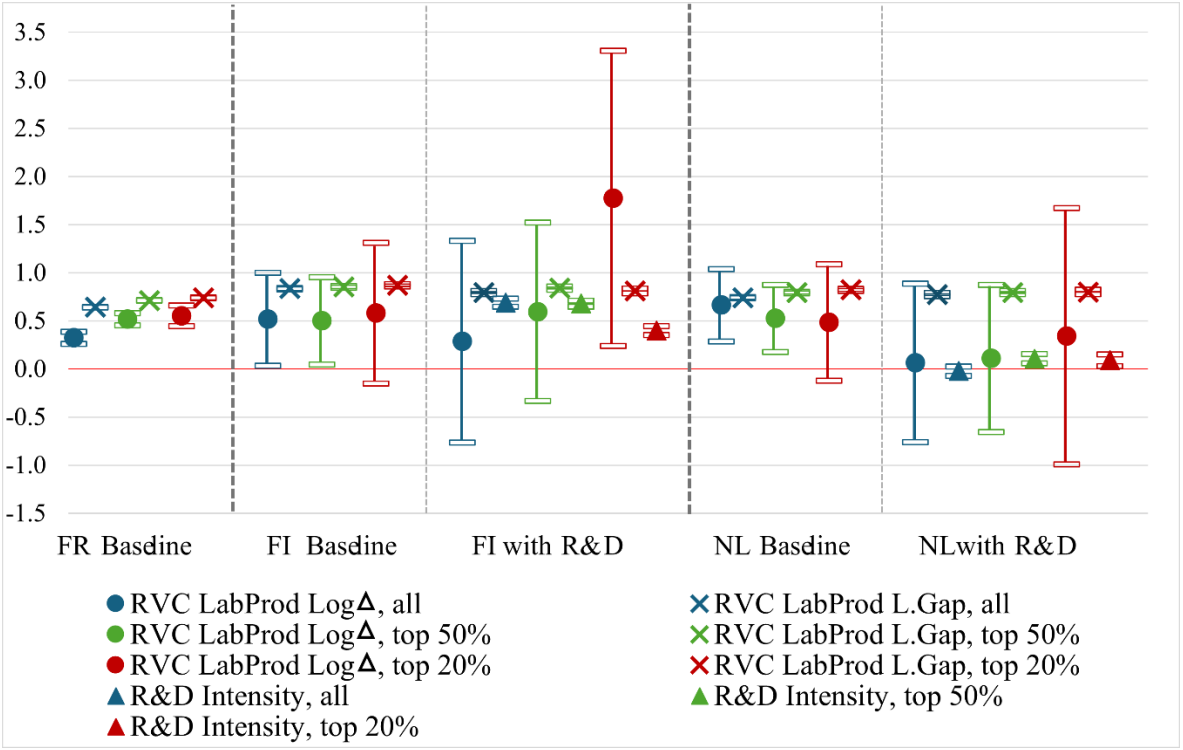
A ~ Agriculture, forestry and fishing
B ~ Mining and quarrying
C ~ Manufacturing
D ~ Electricity, gas, steam and air conditioning supply
E ~ Water supply; sewerage, waste management and remediation activities
F ~ Construction
G ~ Wholesale and retail trade; repair of motor vehicles and motorcycles
H ~ Transportation and storage
I ~ Accommodation and food activities
J ~ Information and communication
L ~ Real estate activities
M ~ Professional, scientific and technical activities
N ~ Administrative and support service activities
S ~ Other services activities

The most R&D intensive macro-sectors tend overperform the prediction from the respective RVC productivity growth rate

Source: MDI and CompNet 9th Vintage.
Note: R&D is total R&D expenditure per worker.

Micro Evidence II – Firm Productivity and RVCs

Effect of European RVCs on Firm Productivity Log Growth, by Firm Productivity

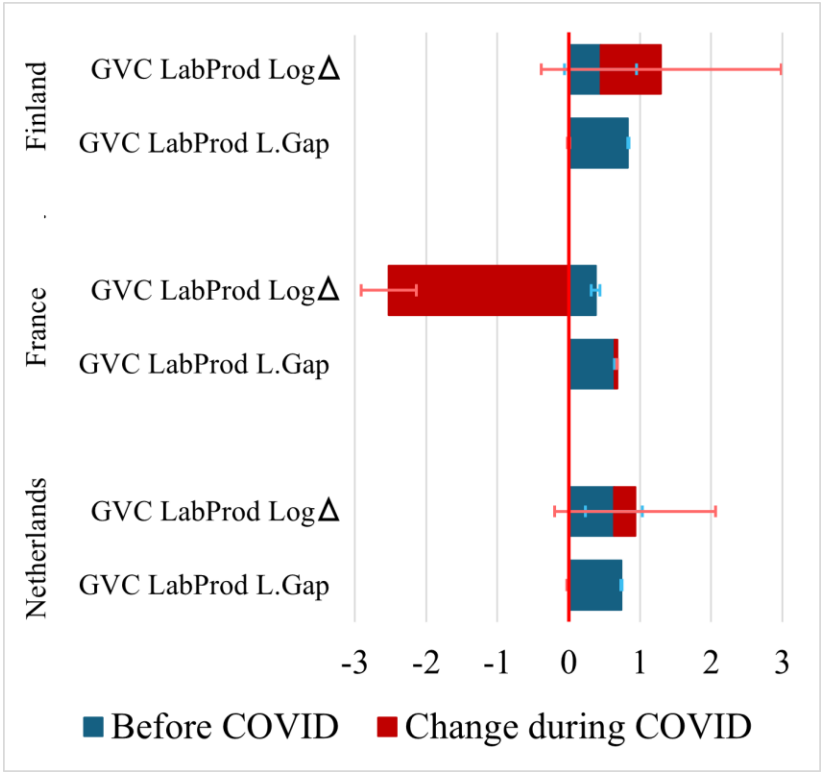


Source: MDI and CompNet 9*th* Vintage.
Note: Dependent variable is firm-level *LabProd Log*Δ, estimated with firm and year fixed effects. For each country, top 50% and top 20% are estimations only on firms whose labor productivity is above the median and in the last quintile of the distribution, respectively. *GVC LabProdLog*Δ and *GVC LabProdL.Gap* are computed for total trade (exports plus imports). *R&DIntensity* is R&D expenditure per worker; such information is not available for France. Lines and traits represent 95% confidence intervals.

- Once **R&D** is factored in, the **direct productivity transmission** from EU RVCs usually **loses statistical significance**
- In contrast, **catching up with EU RVCs remains a strong driver** of firm productivity, even after R&D is factored in
- The **top 20% productive firms** are **more responsive** to EU RVC productivity shocks **in France and Finland, but not in the Netherlands**

Micro Evidence III – EU RVCs and Covid

Impact of COVID on Firm Responsiveness to EU RVCs Productivity Shocks



Source: MDI and CompNet 9*th* Vintage.
Note: Dependent variable is firm-level *LabProd Log*Δ, estimated with firm and year fixed effects. For each country, top 50% and top 20% are estimations only on firms whose labor productivity is above the median and in the last quintile of the distribution, respectively. *GVC LabProdLog*Δ and *GVC LabProdL.Gap* are computed for total trade (exports plus imports). *R&DIntensity* is R&D expenditure per worker; such information is not available for France. Lines and traits represent 95% confidence intervals.

- Unlikely Finland and the Netherlands, **France experienced a significant drop in its responsiveness** to EU RVCs productivity shocks **during COVID**
- **Catching-up with EU RVCs was not jeopardized during COVID** in the selected countries

Conclusions

EU RVCs shape industry- and firm-level productivity patterns (2-stage diffusion)

Catching up with EU RVCs is a particularly powerful driver of productivity growth, on top of other firm characteristics (R&D)

However, EU RVCs demonstrate limited resilience in the face of crises

Among the countries in our sample, only in France COVID impacted negatively responsiveness to EU RVCs shocks (thus favoring robustness?)

Future Work

Disentangle the responsiveness to positive and negative EU RVC shocks

Include more countries in the analysis: are CESEE countries different?

Leverage a higher degree of firm heterogeneity (MNEs, diversification of trade linkages, reliance on critical imports)

Investigate RVC productivity transmission developments during crises separately for differently productive firms

Employ more refined measures of GVC participation (Borin and Mancini, 2019)

Thanks for your attention

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