CPAG Research Report

Technology Diffusion through Trade within the EU

How goods, services and supply chains carry know-how — and why parts of Europe are starting to fall behind.

PERIOD COVERED
1995 – 2025

DATA SOURCES
OECD TiVA · ILO

FOCUS
EU-27 + Romania, Czechia, Hungary, Poland

Technology Diffusion through Trade within the EU

How goods, services and supply chains carry know-how —and why parts of Europe are starting to fall behind.

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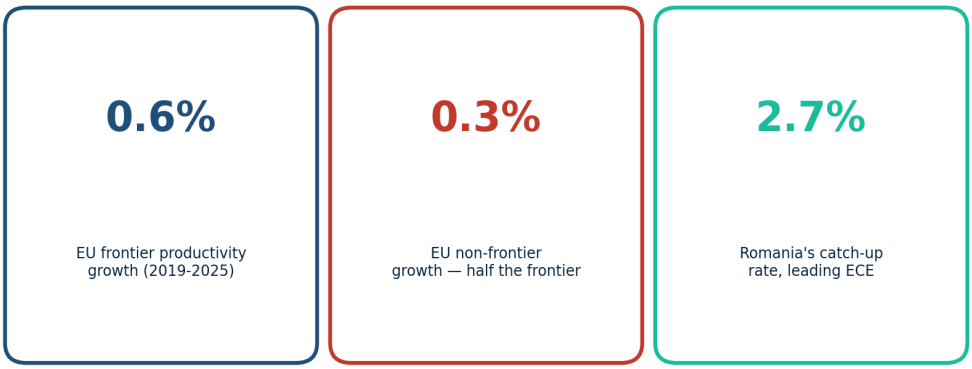
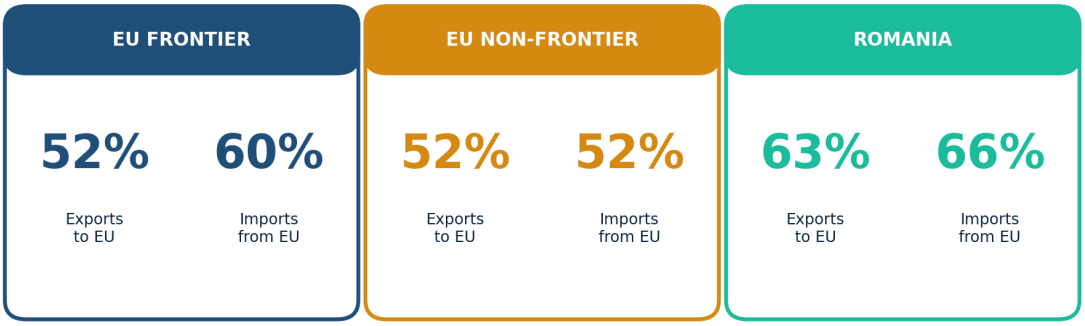
SNAPSHOT

The story in numbers



Share of trade with EU partners

Exports and imports going to / coming from inside the EU (2019-2022 average)



The headline

Trade carries technology between countries — through the machines they buy, the markets they sell into, and the firms they connect with. Since 2019 something has changed in Europe.

- The EU's most productive economies (the frontier) and the world's most productive economies have slowed in step (~0.6% productivity growth a year).
- The EU non frontier— the 22 mid-tier member states — slowed even more, to half that rate.
- Central & Eastern Europe (Romania, Poland, Hungary, Czechia) kept catching up, but a ceiling is becoming visible.
- Trade has been quietly reorganized: more intra-EU sourcing, more middle-tier partners, less exposure to the world's most productive economies.

Main findings

FINDING 01

EU and world frontiers grew in tandem; non-frontier fell behind.

In 1995–2019 EU frontier, EU non-frontier and world frontier grew in tandem, with the world frontier remaining 22% ahead of the EU frontier on average. After 2019 productivity growth halved globally; EU and world frontiers decelerated in tandem. EU non-frontier growth fell to half the frontier rate.

FINDING 02

ECE confirmed the advantage-of-backwardness mechanism — but a threshold has appeared.

In 1995–2019, ECE countries with the largest productivity gaps grew fastest. After 2019 ECE countries give evidence of a productivity threshold at approximately 50% of frontier productivity, beyond which the advantage of technological backwardness diminishes or disappears. Czechia's and EU non-frontier's underperformance is telling — suggesting either a shrinking technology gap or an inability to absorb frontier technologies, particularly in AI and ICT.

FINDING 03

Three-tier productivity structure emerged post-2019.

After overlapping shocks, EU productivity split into three distinct layers: the EU frontier growing in line with the world frontier (CAGR 0.6% vs 0.5%), the EU non-frontier growing at half that rate (CAGR 0.3%), and ECE countries growing significantly faster (Romania 2.7%, Poland 2.3%).

FINDING 04

The advantage of technological backwardness holds — but only up to a threshold.

Romania, Poland, and Hungary confirmed Acemoglu et al.'s (2026) prediction: the larger the productivity gap relative to the frontier, the faster the growth. However, this advantage appears to vanish at around 50% of EU frontier productivity, beyond which catching-up stalls or reverses.

FINDING 05

Czechia may have crossed the backwardness threshold.

At 38% of EU frontier productivity, Czechia's growth rate converged to the frontier rate — suggesting it has entered a zone where the technology-diffusion benefit diminishes, despite not yet reaching frontier levels.

FINDING 06

EU non-frontier is caught in a competitiveness trap.

With average productivity at half the EU frontier, EU non-frontier countries grew at only half the frontier's rate post-2019. This is attributed either to a productivity gap too narrow to sustain easy technology absorption, or to frontier technologies (particularly AI and ICT) being inappropriate for their institutional and skill contexts.

FINDING 07

EU trade shifted structurally toward intermediates and intra-EU sourcing post-2019.

The share of final goods in both exports and imports declined across all groups, reflecting deeper GVC embeddedness. Additionally, the EU frontier's share of imports from within the EU jumped from 54% to 60%, signalling a deliberate supply-chain regionalisation driven by post-pandemic de-risking.

FINDING 08

The EU frontier is downgrading its OECD trade partner quality.

After 2019, EU frontier countries shifted exports away from high-productivity OECD partners toward lower-productivity ones, while maintaining ties only with the very top (world frontier). This trade-partner downgrading reduces exposure to the productivity spillovers historically associated with high-standard markets.

FINDING 09

Within EU, trade is polarising toward middle-productivity and ultra-high-productivity partners.

Across all country groups, the share of trade with “high”-productivity EU partners collapsed (by ~10–20 percentage points), redistributed toward the “middle” tier and outliers (Luxembourg, Ireland). This reflects both value-chain restructuring and a comfort-zone dynamic where countries gravitate toward peers.

FINDING 10

ECE is deepening intra-regional trade while increasing cheap-input sourcing from outside EU.

All four ECE countries reduced trade with low-productivity EU partners and expanded ties with middle-tier EU partners — each other and newer EU members — indicating an emerging CEE sub-regional economy. Simultaneously, OECD imports became increasingly concentrated in low-productivity partners (reaching 48–60% of OECD imports), reflecting cost-driven supply-chain strategies.

FINDING 11

Romania and Poland are emerging as a digital services corridor within ECE.

Both countries lead ECE in IT export shares, particularly to non-EU markets (Romania at 9%, Poland at 6% of ROW exports). This signals endogenous capability building beyond traditional assembly — their most promising long-run comparative advantage.

FINDING 12

Hungary is the most structurally vulnerable ECE economy.

Its FDI-driven assembly model has exhausted its convergence potential: the productivity gap with OECD trading partners stalled after 2012, services exports remain the weakest of the four (27% in 2022), and IT export presence is minimal. Without structural diversification, the model faces a ceiling with no clear escape route.

PART 1

How trade spreads technology

New ideas rarely spread on their own. Most of the time they hitch a ride on something concrete — a machine, a software package, a manager who has done the job before, or a customer who demands a higher standard. Trade is one of the great vehicles for that ride.

Importing a German robot doesn't just buy you the robot — it buys you embedded engineering and supplier relationships. Exporting to a demanding Swiss customer forces a Polish plant to upgrade its quality systems. Hosting an Austrian carmaker introduces local engineers to global supply chains they couldn't have built from scratch. Economists call this technology diffusion.

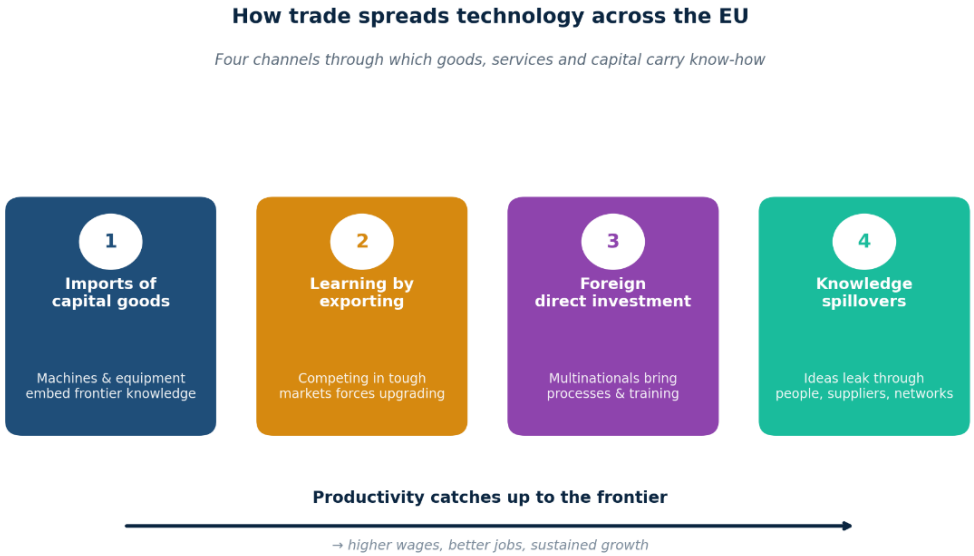


Figure 1. *Four ways trade spreads technology between countries.*

Two ideas worth knowing

The advantage of being behind. Countries that are behind the leader can grow faster than the leader by copying frontier technologies. The further behind, the more there is to copy. (Acemoglu, Akcigit & Johnson, 2026.)

Absorptive capacity. Trade only spreads technology if the receiving country has the skills, institutions and infrastructure to actually use it. Otherwise, trade flows but technology doesn't. (Atkinson & Stiglitz 1969; Rodrik 2007.)

PART 2

Three speeds of EU productivity

Until 2019, productivity in the EU broadly tracked the world frontier. The most productive EU economies grew at about 1% a year. Mid-tier EU economies grew at about 1.3%. Romania, Poland, Hungary and Czechia grew at 2-3% — exactly as the 'advantage of being behind' would predict.

After 2019 the picture fractured into three distinct layers. The EU frontier slowed in step with the world frontier (CAGR 0.6% vs 0.5%). The EU non frontier slowed to half that rate (CAGR 0.3%). Central & Eastern Europe kept growing faster — but unevenly, and only some of it lasting.

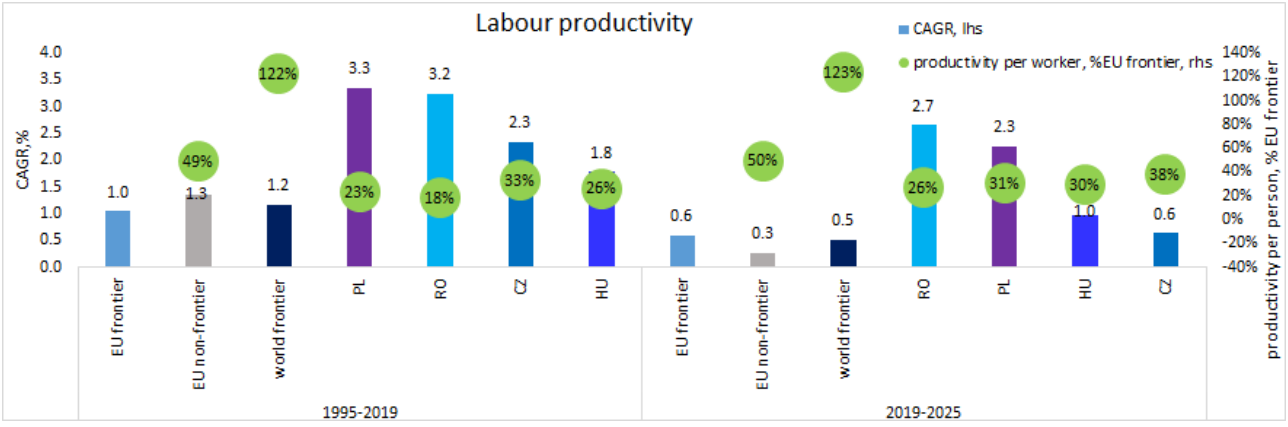


Figure 2. *Labour productivity — annual growth rate (left) and productivity per worker as % of EU frontier (right). Source: ILO.*

A new ceiling appears at ~50% of frontier productivity

Romania, Poland and Hungary still grow fast — they sit well below the EU frontier (between 26% and 31% of frontier productivity in 2019-2025). Czechia, at 38%, has slowed almost to frontier-level growth. The EU non-frontier as a group — at half of frontier productivity — has slowed even more.

The pattern suggests a threshold: once a country reaches roughly 50% of frontier productivity, the easy gains from copying frontier technologies start to vanish. From that point on, growth depends on the country's own innovation, not on imported know-how.

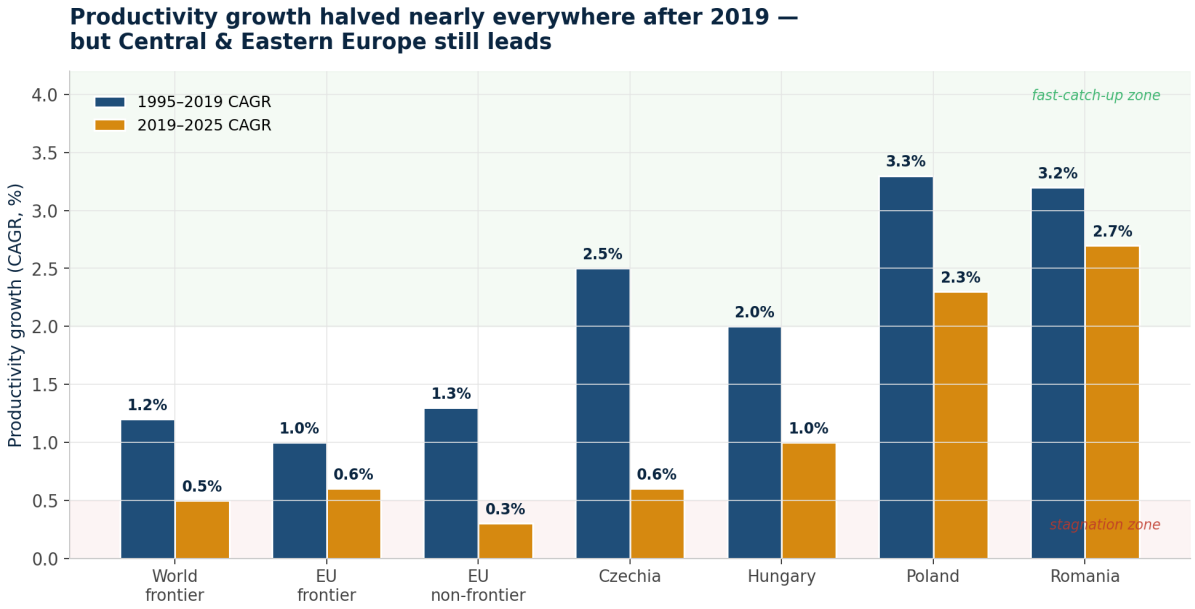


Figure 3 *Productivity growth before and after 2019 — summary view. Source: ILO statistic on labour productivity, 2025.*

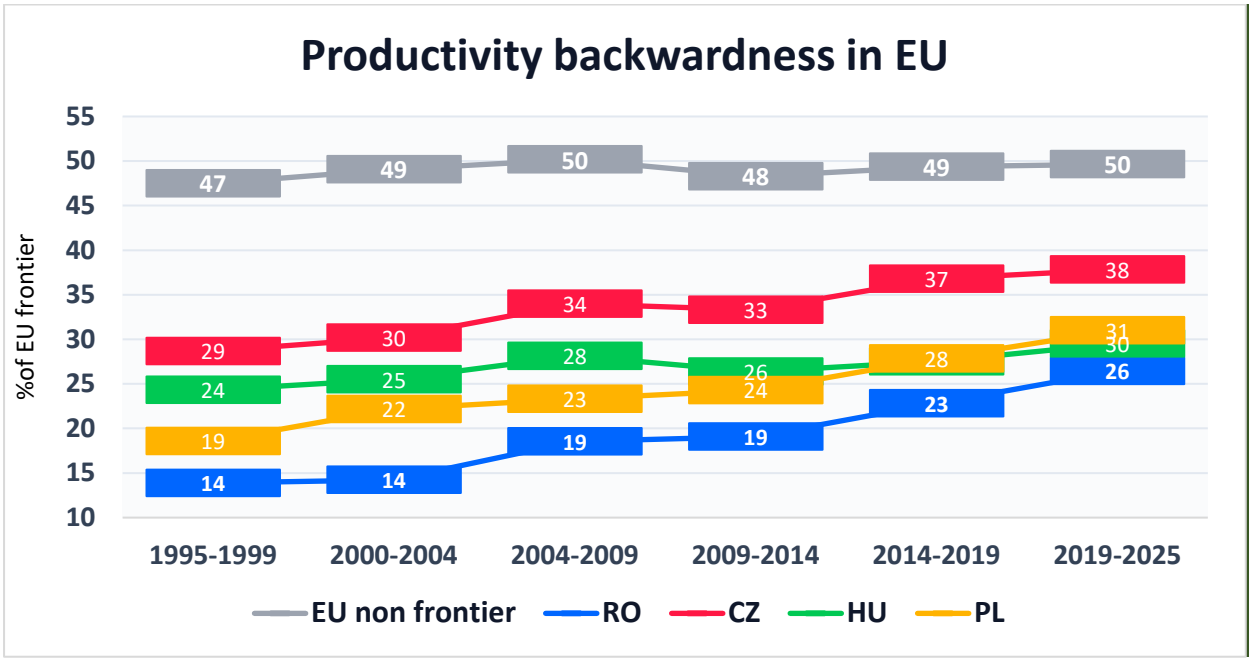


Figure 4. *Productivity backwardness in the EU — productivity as % of EU frontier, by 5-year period. Source: ILO.*

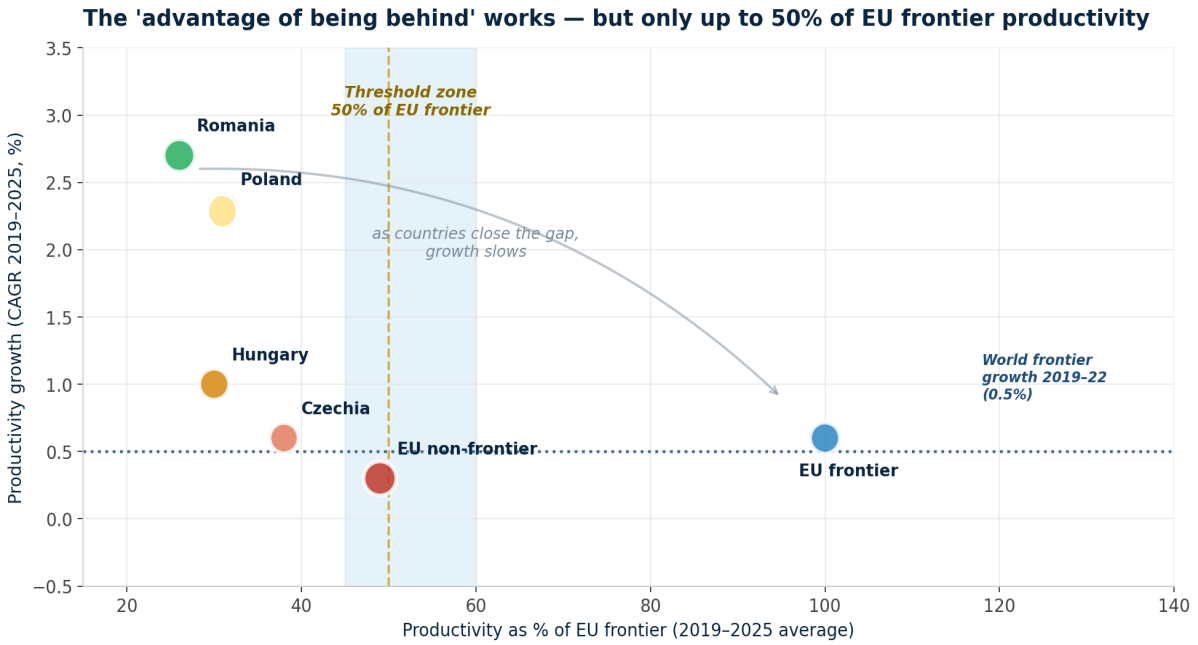


Figure 5. *The 50% backwardness threshold. Source: ILO statistic on labour productivity, 2025.*

> There is a sweet spot for catching up. If you're far behind, you can copy a lot — and you grow fast. Once you're roughly half as productive as the EU frontier, the easy gains run out. From that point on, growth depends on your own innovation.

PART 3

How EU trade reorganised after 2019

After 2019, EU exports to non-EU OECD partners barely grew at all (0.3% a year). Imports from those same partners surged (4.6%). Imports inside the EU grew even faster (5.2%). EU trade is dominated by trade between EU member states — about 51% of exports and 52% of imports stay inside the bloc. Trade with the OECD makes up most of the rest. The geographic mix of trade looks similar today to thirty years ago — but the composition has changed in important ways.

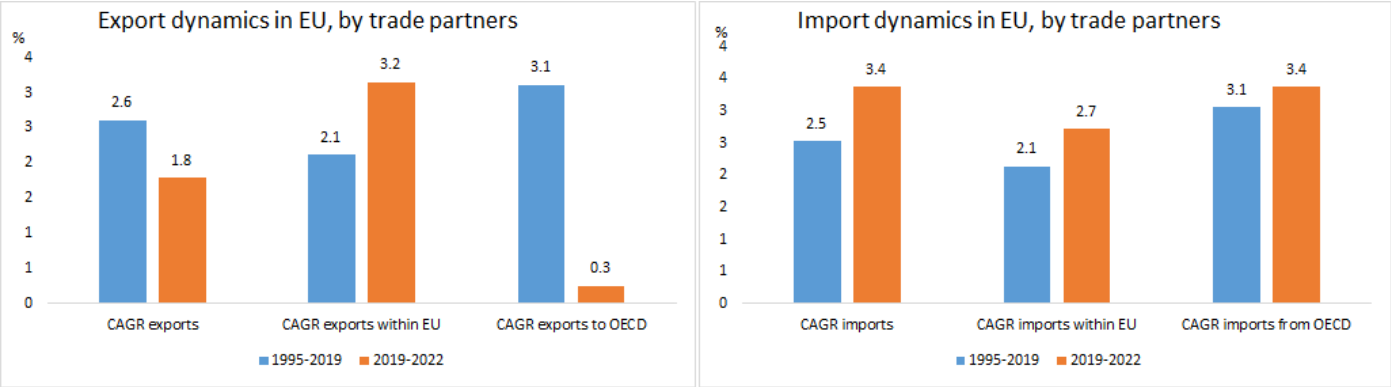


Figure 6. *Export – import dynamics in the EU, by trade partners. Note: CAGR based on values in USD 2015 prices. Source: OECD TiVA.*

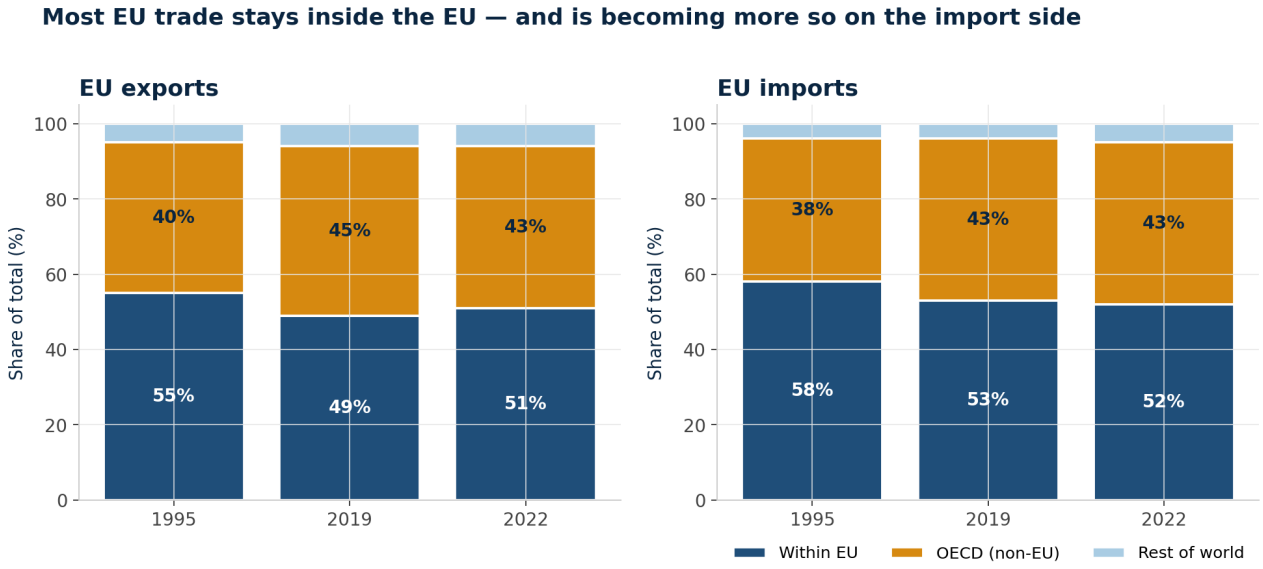


Figure 7. *Geographic mix of EU trade — summary view. Source: OECD TiVA database.*

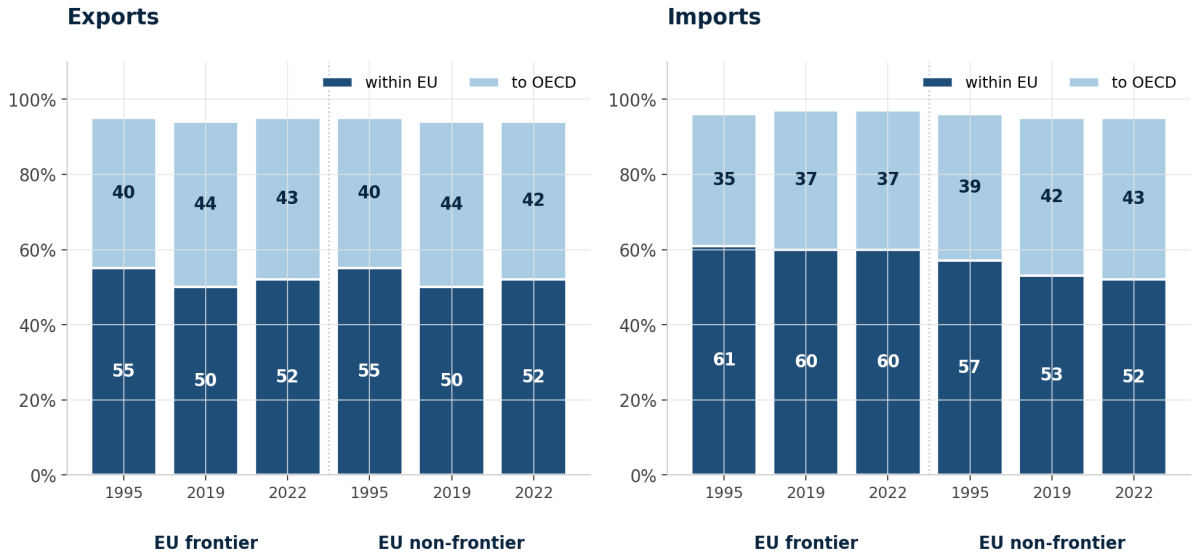


Figure 8. *Geographic mix of trade in EU frontier and EU non-frontier — within EU vs to OECD, 1995–2022. Source: OECD TiVA database.*

Two opposite shifts after 2019

The flight away of exports within EU toward OECD reversed, but did not in case of imports. While the geographical distribution of exports remained the same in both EU frontier and non-frontier, imports are more biased towards OECD in case of EU non frontier. Procurement decisions adjust faster than export markets because they are made unilaterally.

Inside the EU: trade is polarising

If EU member states are grouped by productivity tier — low (<30% of frontier), middle (30-60%), high (60-99%), the frontier itself, and the super-productive outliers Luxembourg and Ireland — a clear pattern emerges.

After 2019, trade with the 'high' tier (the productive countries just below the frontier) collapsed by 10-20 percentage points across all groups. The middle tier surged. So did trade with the super-productive outliers. EU member states are increasingly trading with peers like themselves and avoiding both the very best and the very productive outliers — except via Luxembourg and Ireland. That's a 'comfort zone' dynamic, and it is also a slow drag on technology diffusion.

The frontier moves to services; the non-frontier doesn't

The biggest long-run change in EU trade is sectoral. The frontier has progressively moved from industry into services. Industry's share of frontier exports fell from 58% in 1995 to 45-48% in 2019-22; services rose from 38% to 50-57%; IT exports went from 2% to 5%. Services are especially strong in non-EU markets — 57% of frontier rest-of-world exports.

The 22 EU non-frontier economies have not made the same transition. Industry still accounts for about 57% of their exports — only three percentage points below 1995. Services are stuck around 38%. This 22-point services gap is where future EU productivity differences will be decided.

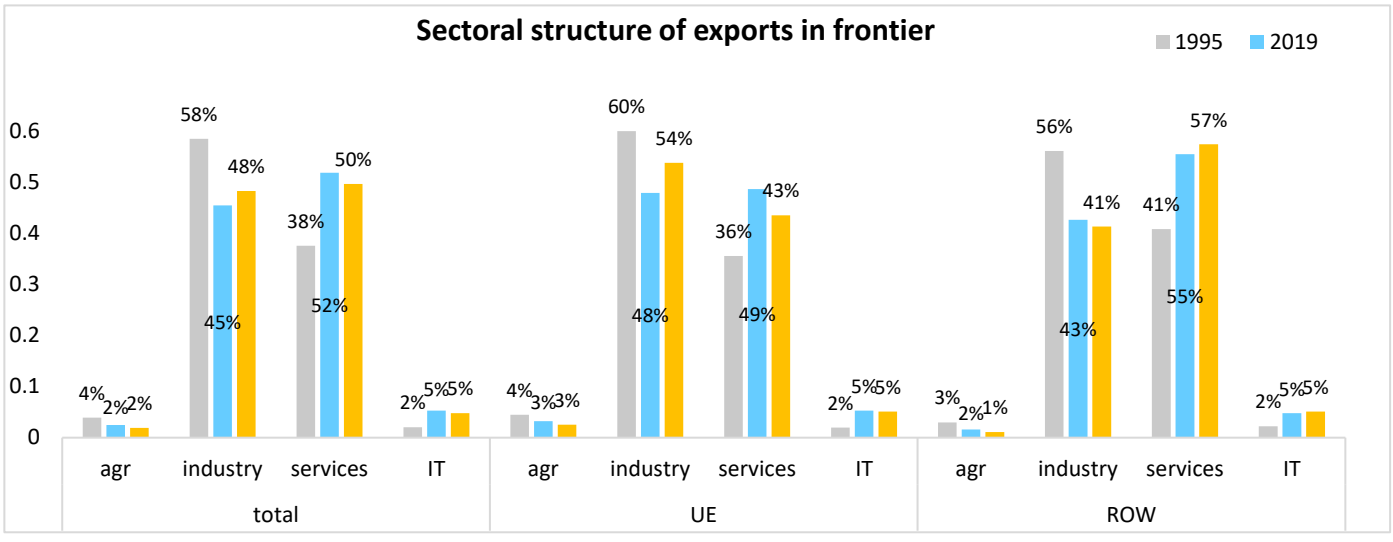


Figure 8. *Sectoral structure of exports — EU frontier. Source: OECD TiVA*

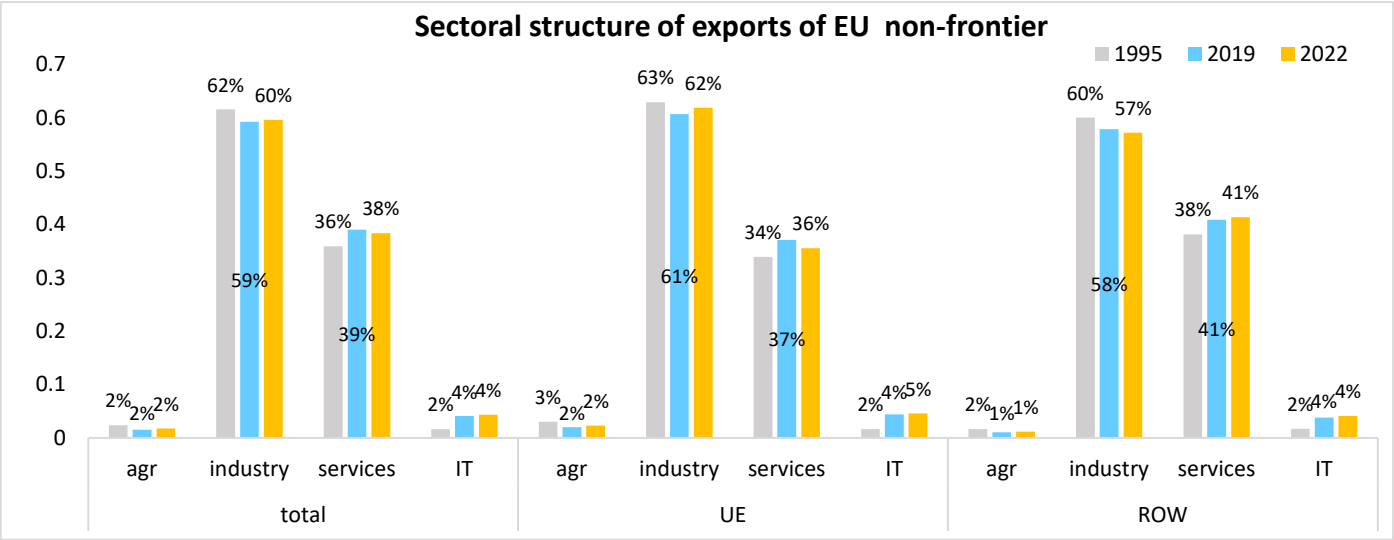


Figure 9. *Sectoral structure of exports — EU non-frontier. Source: OECD TiVA.*

PART 4

The four Central & Eastern European economies

Romania, Poland, Hungary and Czechia entered the EU as similar post-communist economies. Twenty years on, they are following visibly different trajectories.

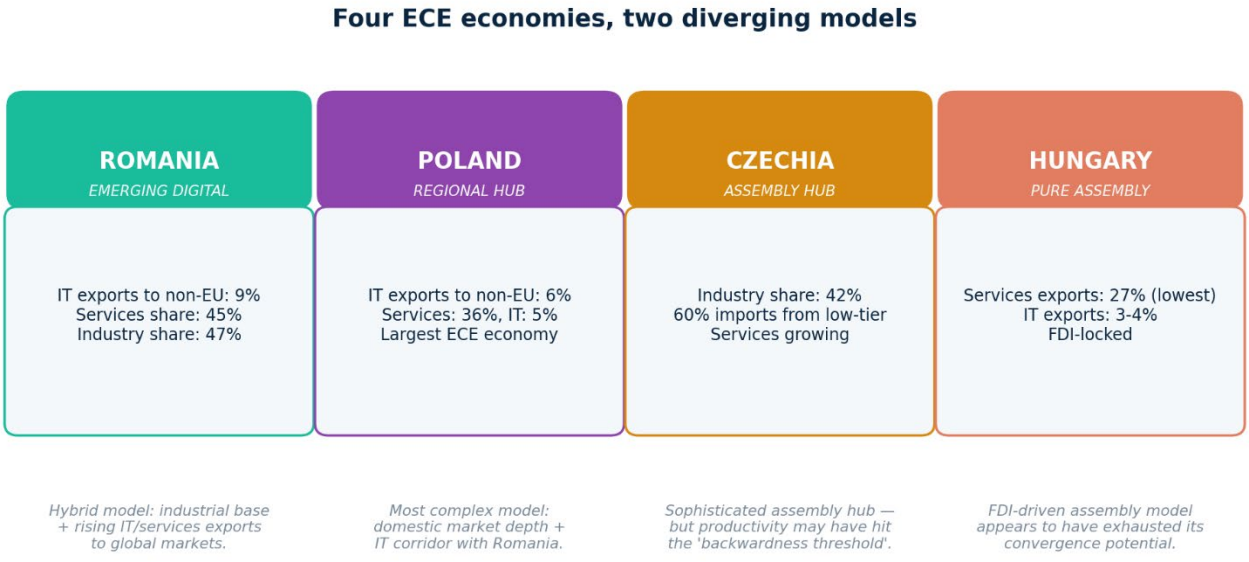


Figure 10. *Four ECE economies — diverging trade and technology profiles.*

Romania — emerging digital

Industry exports fell from 72% to 47%; services rose from 26% to 45%. IT exports to non-EU markets reach 9% — the highest of all four economies. Romania's most promising long-run advantage is its IT and services trajectory to global markets.

Poland — regional hub

The largest ECE economy by trade volume, with the fastest deindustrialization: industry exports fell from 67% to 37% by 2022. IT exports reach 6% in non-EU markets. Poland combines assembly-hub characteristics with regional-hub ambitions and a strong domestic market.

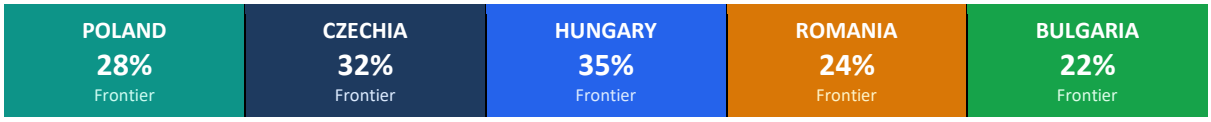
Czechia — sophisticated assembly hub

Industry exports at 42% (down from 73%); services around 42%. 60% of OECD imports come from low-productivity partners — the most aggressive cheap-input sourcing of all four. Czechia's productivity, at 38% of EU frontier, is now growing only as fast as the frontier itself — suggesting it has hit the backwardness threshold.

Hungary — assembly model under stress

Services exports just 27% — the lowest in ECE. IT exports 3-4% — the smallest digital footprint. Trade structure heavily locked into automotive and electronics FDI. The productivity gap with OECD trading partners stalled after 2012. The FDI-driven assembly model appears to have exhausted its convergence potential.

Productivity, % of EU frontier



A digital corridor is emerging

Two of the four — Romania and Poland — are punching above their weight in IT exports, particularly to non-EU markets. This signals genuine endogenous capability, not just imported assembly. If sustained, it could rebalance the region's role from low-cost assembler to mid-tier knowledge economy.

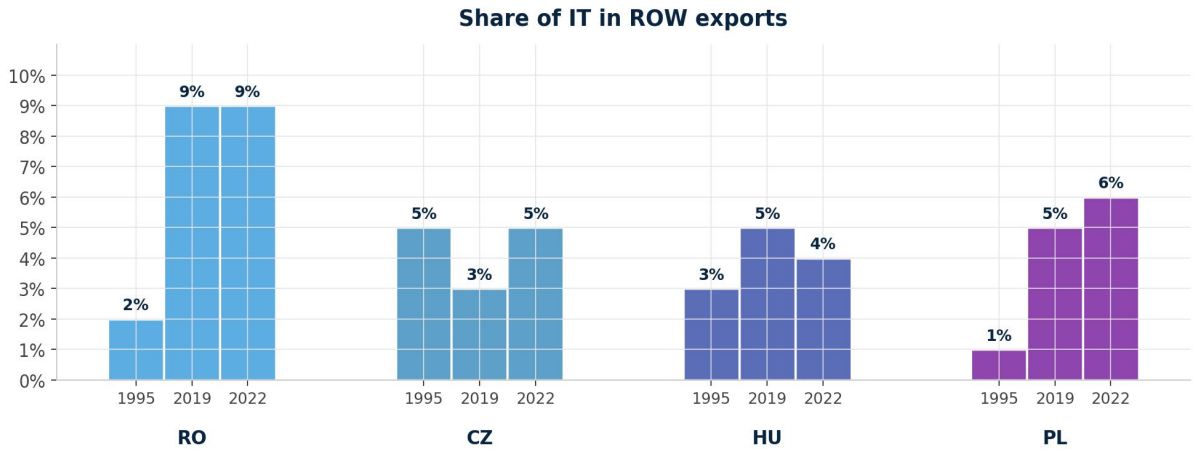


Figure 11. *Share of IT in ROW exports (rest-of-world) for the four ECE economies, 1995–2022. Source: OECD TiVA.*

> Two ECE economies (Romania, Poland) are building a software and services hub for global markets. Two (Czechia, Hungary) remain anchored in industrial assembly — and Hungary's model looks the most exposed to a shock.

PART 5

What it all means

Trade is still spreading technology in Europe — but the channels are working unevenly. Frontier countries get the most out of trade because they have the absorptive capacity to use what they import. Non-frontier countries get less because they don't. ECE countries are running a clock that is starting to wind down.

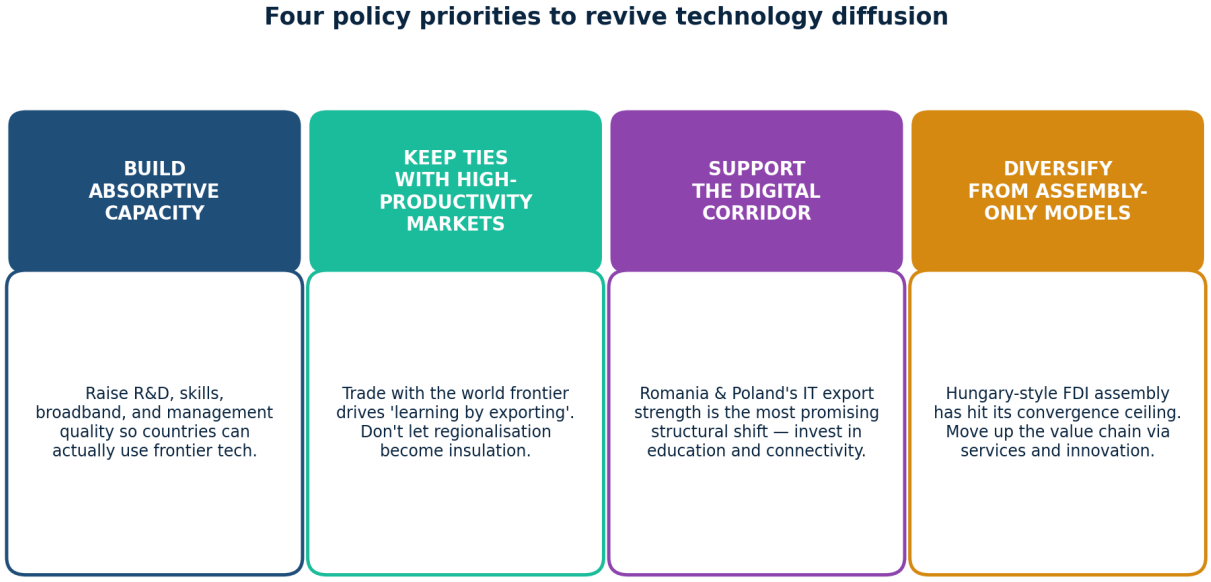


Figure 12. *Four strategic priorities.*

Build absorptive capacity, not just connectivity

Trade flows are necessary but not sufficient. The EU's diffusion engine works only when the receiving country can absorb new technology — which means R&D, skilled labour, broadband, modern management practices and functioning capital markets. EU funds should weight absorptive capacity at least as heavily as physical infrastructure.

Defend exposure to high-productivity partners

Re-shoring and de-risking are sensible responses to genuine geopolitical risk. But the strongest knowledge spillovers come from interaction with the world's most productive economies. Distinguish between strategic dependencies (semiconductors, critical minerals) and ordinary trade — and avoid letting de-risking become a blanket retreat from competitive markets.

Support the emerging digital corridor

Romania and Poland's IT export performance is the most promising structural shift in ECE since EU accession. It is a chance to build a genuinely competitive European software and services hub — but it is fragile. Skilled workers in software are mobile, and the corridor depends on retaining them, on broadband and grid investment, and on a stable regulatory environment.

Diversify away from assembly-only models

Hungary's stalled convergence is the clearest warning sign in the data. FDI-driven assembly models can deliver decades of growth — but only until productivity reaches roughly half of the frontier. After that, the host economy needs to capture more of the value chain through indigenous services, R&D and high-skill activities. The window to start that transition is before the catch-up boost runs out, not after.

The bottom line

Technology diffusion through trade is not broken — but it is bending in ways that quietly favour the EU's strongest economies and disadvantage its middle. The EU's productivity story over the next decade will be written less by trade volumes and more by who Europe trades with, and what its firms can do with what they import.

FINAL REMARKS

Understanding the technology content of trade relationships is essential for designing policies that maximize the productivity benefits of economic integration. For the EU, this suggests that deepening the single market and maintaining strong links with frontier economies—both within and outside the Union—remains important for supporting convergence and productivity growth across all member states.

Consilium Policy Advisors Group · May 2026

Glossary

A short guide to the most important terms used in this brief.

Productivity

Output per worker. The single most important driver of long-run wage growth and living standards. Measured here in 2015 USD per worker (ILO data).

Frontier vs non-frontier

The 'frontier' is the three to five most productive EU economies in any given year — typically Netherlands, Belgium, Denmark, Sweden and France. 'Non-frontier' is the remaining 22 EU economies (excluding the super-productive outliers Luxembourg and Ireland).

Technology diffusion

The spread of know-how — production techniques, software, management practices, scientific knowledge — from places that have it to places that don't. Trade is one of the main vehicles.

Absorptive capacity

A country's ability to actually use the technology it imports. Depends on skills, R&D, institutions, infrastructure and management quality.

Backwardness threshold

The point at which a country's productivity is high enough that the easy gains from copying frontier technology start to disappear. Sits at roughly 50% of frontier productivity in today's EU.

ECE

Central & Eastern Europe — used here to refer to Romania, Poland, Czechia and Hungary.

OECD TiVA

OECD's Trade in Value Added database, the main bilateral trade dataset used in this analysis (1995-2022).