Supply chain lock-in and the selective destruction of EU–UK trade

Jun Du, Oleksandr Shepotylo, Yujie Shi

The Productivity Institute, University of Manchester

Centre for Business Prosperity, Aston University

Macroeconomic Effects of Geopolitical Shocks and Uncertainty

Ten years from the Brexit Referendum

Why a trade problem is a productivity problem

Exporting raises productivity

Exporters learn, scale and face competition. Losing over half of EU export varieties since 2021 removes that channel — mostly for SMEs — and concentrates trade in large firms.

EU supply chains carry technology

UK manufacturing — machinery, transport equipment, pharma — sits inside pan-European value chains. Inputs, know-how and FDI flow through them. The border now taxes every link.

Frictions lock in low productivity

The firms that stayed did so by absorbing cost and compressing margins, not by investing. Held-up trade is not healthy trade.

So the EU trade problem is a productivity problem — and it can only be fixed product by product, sector by sector. Which brings us to the question:

How come some EU–UK trade relationships have **stayed strong** — some have actually grown — while others were **destroyed**?

Brexit and trade: ten years of evidence

What the field has established

- OBR ~4% GDP loss; CER/CEP 5–6% (Springford 2023)
- Bloom et al. (2024): large, persistent losses from uncertainty
- Freeman et al. (2022): extensive margin > intensive margin
- de Lucio et al. (2022): NTMs dominate tariffs as the barrier
- Ten-year reviews confirm: Portes (UKICE 2026), Wilkes (IfG 2025)

What we have built: four papers, five years

2022 Du & Shepotylo. First causal estimate of the TCA effect, on its first six months. Reported by the BBC.

2023 Du, Satoglu & Shepotylo (Contemporary Social Science). Effect persisted and deepened through 2022Q1.

2024 Du, Liu, Shepotylo & Shi, "Unbound" (R&R in European Economics Review). Three years: variety loss; NTMs ≈ 70% of export decline.

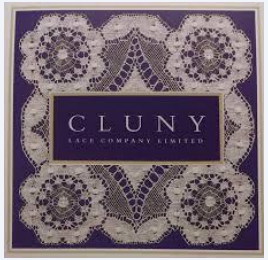
2026 This paper. Five years; 2,700+ product-partner effects; supply chains and TBT.

Plus underpinning studies on the SPS agreement and mutual recognition of conformity assessment. Same SDID design, same HS6 data, same team — comparable across five years.

The macro verdict is settled. *The micro structure is not.*

Two sides of the same border

DESTROYED



Cluny Lace (est. 1760, Ilkeston): 8% RoO duty on re-imported lace after French dyeing. 6 of 10 staff laid off. Terminal closure risk.

Hartington Creamery: £180 health certificate per order killed EU exports.

Fishing sector: Shellfish exporters lost 24-48hrs to SPS paperwork; spoilage destroyed margins.

~20,000 SMEs stopped exporting (LSE CEP estimate). Low-value, arm's-length relationships exited first.

SURVIVED

BMW Mini (Cowley, Oxford): crankshaft crosses Channel 3-4 times. £600m+ sunk investment. Absorbed new costs. Did not relocate.

Airbus wings (Broughton): deeply embedded in EU supply chain. Compliance costs absorbed due to irreplaceable co-specialisation.

AstraZeneca pharma supply chains: bilateral dependence in active ingredients kept trade flowing despite new regulatory overhead.

Same border, opposite outcomes. ***The difference: supply chain depth and co-specialised bilateral investment*.**

Research questions

RQ1: Why did the TCA produce selective destruction of trade relationships?

RQ2: What role do supply chain linkages and co-specialised bilateral investment play?

Data and research design

Data

- TDM bilateral monthly trade, HS6, 100 countries, Jan 2017 – Oct 2025
- AIPNET production network linkages at HS2 level
- RoO measured via ROO-RI (Ayele et al. 2023) — 1–10 scale normalised to 0–1

Two-stage design

Stage 1: SDID (aggregate) + PPML gravity → 2,673 cell-specific β_{ij}

Stage 2: $\beta_{jk} = \alpha + \gamma_a \cdot Zpolicy + \gamma^b \cdot Zsupply + \gamma c \cdot Zproduct + \gamma d \cdot Zcountry + \varepsilon_{jk}$

Four outcomes

Import value | Import variety | Export value | Export variety

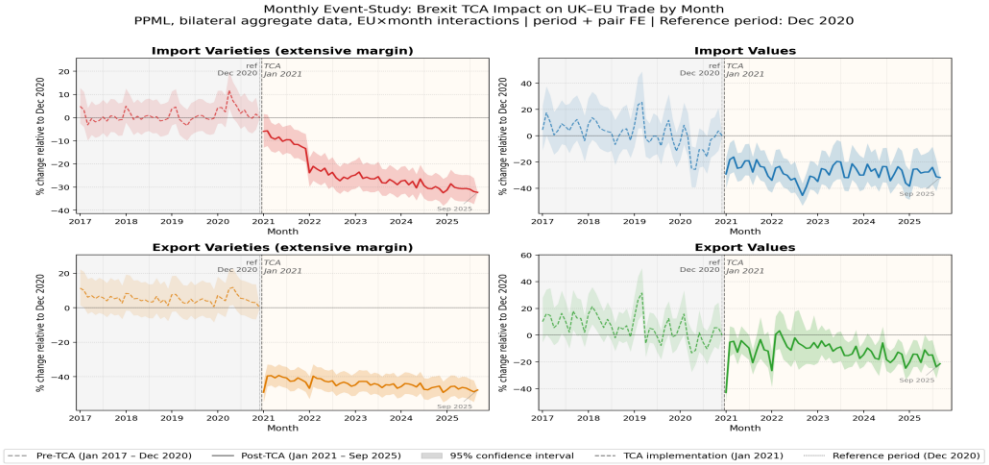
Four Z-groups (pre-TCA 2017-2020 averages)

Z-policy	TBT, SPS, RoO index (Ayele et 2023), tariff rate
Z-supply	AIPNET M1_prop, M2_prop, M1_EU (network centrality)
Z-product	BEC end-use, Rauch classification, perishability
Z-country	GDP, distance, pre-TCA UK trade intensity

Aggregate effects — five years on

	Import value	Import variety	Export value	Export variety
SDID δ	−0.263***	−0.378***	−0.180***	−0.773***
Change (%)	−23.1%	−31.5%	−16.5%	**−53.8%**

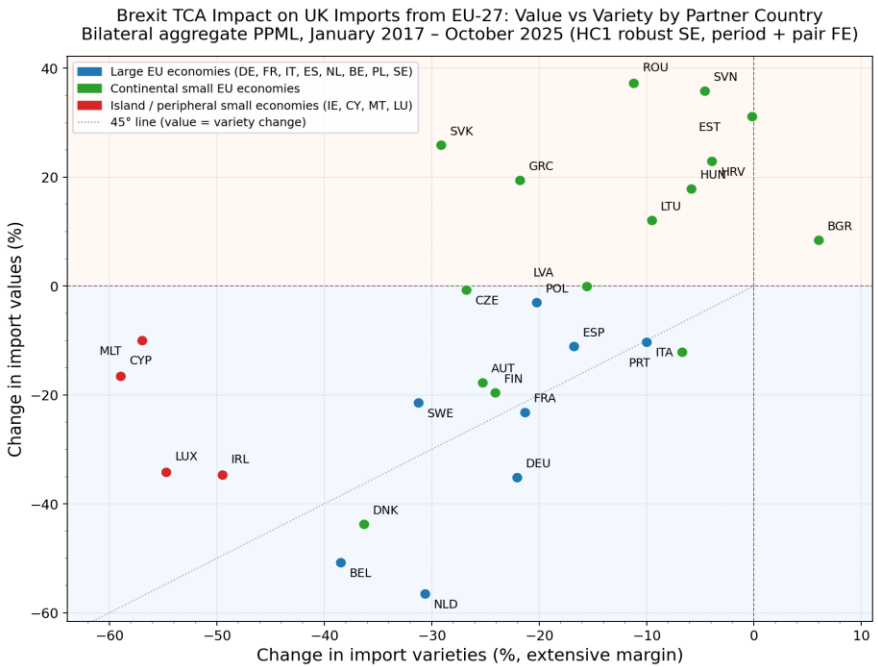
- Variety losses 2–3× value losses → intensive margin compensation
- Pattern predicted by lock-in: embedded relationships absorb, marginal exit
- **Export variety collapse (54%) is the headline finding**



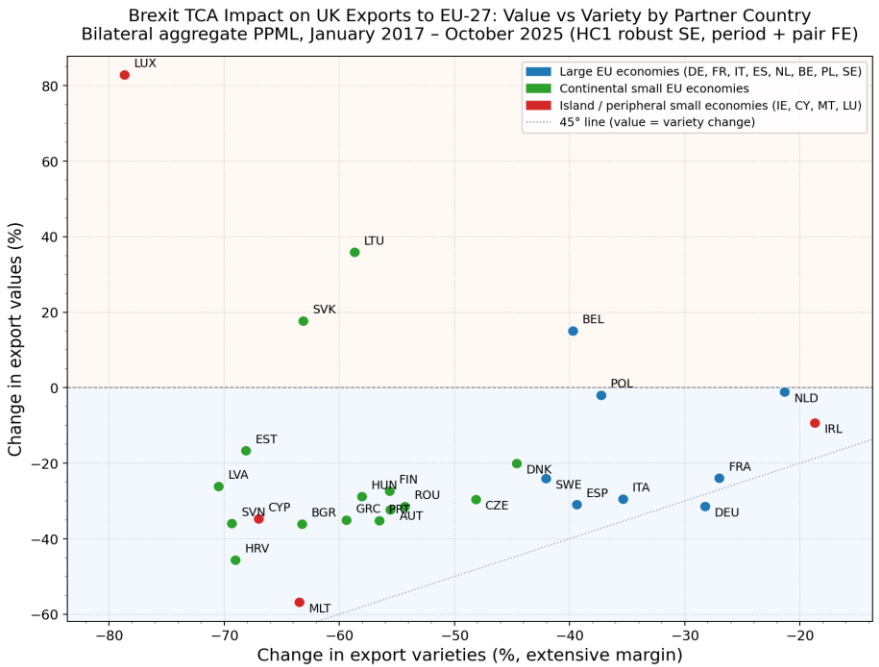
No recovery through Oct 2025 — five years rules out adjustment friction. Pre-treatment coefficients centred on zero (parallel trends).

Heterogeneity — EU partner effects

Imports by EU partner



Exports by EU partner



Every EU partner shows negative export variety effects. ***Universal pattern motivates ANOVA decomposition: is it country or product?***

ANOVA — product characteristics dominate

Exports

HS2 R^2 = **25.5%** vs Country R^2 = **2.3%**

Ratio > 10 : 1

Imports

HS2 ≈ Country ≈ **15%**

Roughly symmetric sources

Heterogeneity is overwhelmingly about ***what product***, not *which country*.

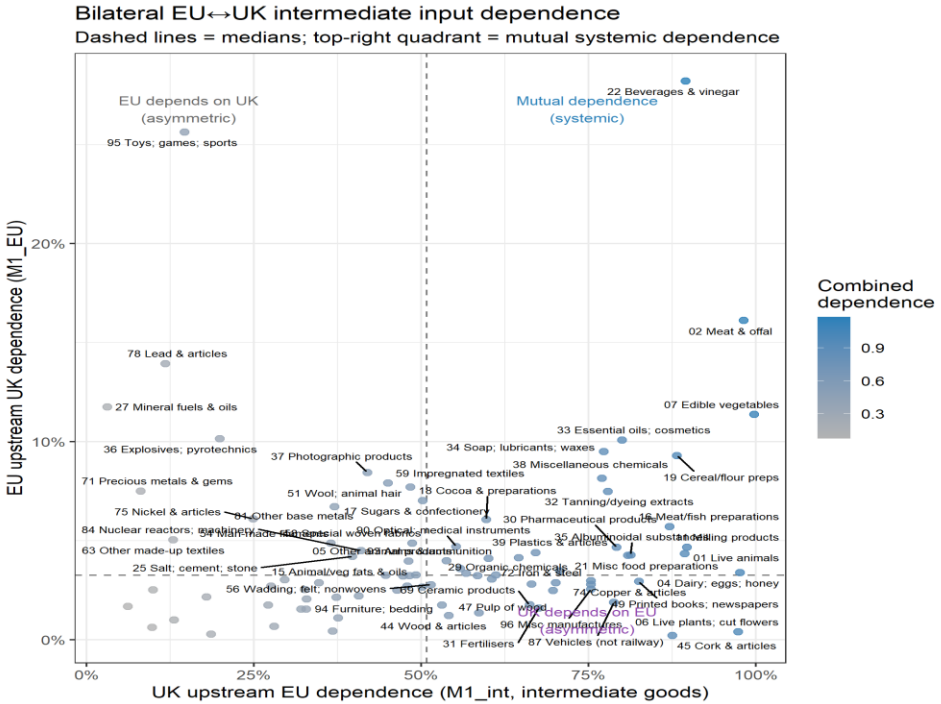
Motivates product-level structural drivers: supply chains, NTMs, RoO, end-use.

Supply chain channels

Second-stage OLS — exports

	Exp. value	Exp. variety
M1_prop (UK upstream EU dependence)	2.003***	0.812*
M2_prop (UK downstream EU dependence)	2.659***	2.265**
M1_EU (EU dependence on UK inputs)	1.296***	1.490***

All three network measures positive and significant — deeper supply chain integration predicts resilience.



25 HS2 chapters in mutual systemic dependence quadrant — pharma, chemicals, automotive, dairy.

Trade Policy

Variable	Import value	Import variety	Export value	Export variety
TBT (count)	−0.195*	-0.056	−0.340***	−0.337***
SPS (count)	0.203**	-0.032	0.079	0.002
RoO (0–1)	0.374***	0.080	0.342***	0.130*
MFN tariff rate	−0.072**	-0.057	−0.011	−0.040**

Key findings

- TBT is dominant export barrier; MFN tariffs have a consistent effect as TBT but with a smaller magnitude
- Revises 3-year finding: TBT overtook SPS as binding constraint
- SPS positive for imports reflects lock-in composition (essential goods)
- RoO positive — selection, not protection

Policy implications — for the UK–EU reset

1 **SPS agreement welcome but TBT conformity is the dominant barrier**

EU–Switzerland MRA provide an institutional precedent for mutual recognition of conformity assessment, which covers twenty product categories and has run since 2002

2 **Target mutual dependence sectors**

25 HS2 chapters in the mutual dependence quadrant — where both UK upstream reliance on EU inputs and EU reliance on UK inputs are above median — are where conformity assessment agreements would have the highest return. The clearest case is the pharmaceuticals.

3 **Mind systemic fragility**

Absorption ≠ costless. It compresses margins, discourages new investment, and creates latent fragility.

Conclusion and next step

Conclusion

- The extensive margin collapse has deepened and shows no sign of recovery.
- The heterogeneity is overwhelmingly about what is traded, not with whom.
- Co-specialised assets → absorption. Arm's-length → destruction.
- At five years and finer resolution than our earlier work, TBT emerges as the dominant export barrier, with conformity assessment as the plausible mechanism.

Next stage

- **Research Objective:** To identify, from firm-to-firm shipment data, whether relationship stickiness decides which supply chain links are destroyed and which recover under disruption — and whether that protection holds only for frictions that can be shared.
- We have built a monthly, product-level index of supply chain disruption: the share of established buyer–supplier relationships that break and later recover. It places the US-China trade war, COVID, Brexit, the Red Sea crisis and the 2025 tariffs on a single comparable scale.
- We then ask a question at the firm level. When a market is disrupted, does the stickiness of the relationship between a supplier and its buyer decide whether the link is destroyed or recovers? And is that protection conditional on the nature of the shock — holding for frictions that buyer and seller can share, such as a tariff, but not for those they cannot, such as a closed shipping lane (Iran war)?

Thank you. Questions welcome.

yujie.shi@manchester.ac.uk