# Ports and Power

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Tinos, $11^{th}$ July 2025

# Why the Sea Matters



- Maritime trade is the backbone of global commerce
- **90%** of global goods value travels by sea
- Shipping accounts for **53%** of China's total trade value

# EU–China

**€213**
Exports to China

*Deficit:* **€305**

**€518**
Imports from China

The EU views China "as a **partner**, a **competitor** and a **systemic rival**."
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- Chinese FDI makes up only 0.7% of the EU's inward stock...
- ...but it controls 10% of European port-terminal capacity!

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- Maritime Silk Road (Belt & Road Initiative)
- Possibly rewiring regional networks

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**Not "just another" trade panel:** 1.5 million truck-level shipments map Europe's true road-freight arteries $\longrightarrow$ Can uncover reroutings and loss in diversity of trading partners that aggregates wash out.

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Lessons:

- Good data!
- Hugely underexplored
- Micro-trade patterns

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- **Rich micro-data:** 1.5 million truck-level shipments, disaggregated by region-industry-year
- **Exposure "dose" DiD design:** Staggered port-acquisition shocks weighted by pre-treatment port-reliance

# Defining the Shock

$$D_{p,t} = \begin{cases} 1, & t \geq T_p, \\ 0, & t < T_p, \end{cases} \quad \text{with } T_p = \text{year COSCO acquires port } p.$$

- Staggered timing across ports $p \in \mathcal{P}$
- Each $D_{p,t}$ "switches on" at the acquisition date; stays on thereafter.

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# Baseline Port–Region Reliance Metric

For each COSCO port $p$ and origin–industry region $(i, j)$, define

$$\text{port\_rel}_{p,ij} = \frac{w_{ij \to p}}{\sum_{d \in \mathcal{D}} w_{ij \to d}}.$$

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- $w_{ij \to p}$ is the total trade flow from region $i$, industry $j$ into port $p$. I also do the opposite, $w_{p \to ij}$, from port $p$.
- $\mathcal{D}$ is the set of all destination regions.

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## Key Property

$$\sum_{d \in \mathcal{D}} \text{port\_rel}_{d,ij} = 1 \quad \text{but} \quad \sum_{p \in \mathcal{P}} \text{port\_rel}_{p,ij} < 1,$$

where $\mathcal{P} \subset \mathcal{D}$ is the subset of port regions.

# Constructing the Exposure Dose

I form a continuous "dose" by weighting each port shock by baseline reliance:

$$\exp_{p,\,ij,\,t} = D_{p,t} \times \text{port\_rel}_{p,ij} \quad \text{and} \quad \text{exposure}_{ij,\,t} = \sum_{p \in \mathcal{P}} \exp_{p,\,ij,\,t}\,.$$

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- **Stepwise "dose":** each port's shock flips on only at its acquisition year $T_p$.
- **Weighted impact:** regions more reliant on an early-acquired port receive a larger "injection" of exposure sooner.
- **Continuous intensity:** summing across ports gives the full, time-varying strength of COSCO's entry for each origin–industry.

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*Note:* Because each $D_{p,t}$ "switches on" at its own $T_p$, a region $i$ in industry $j$'s total exposure jumps upward in discrete steps whenever one of its key ports comes under COSCO control.

# Event-Study: Continuous-Treatment Specification

I estimate

$$y_{ijt} = \sum_{k=-K_0}^{K_1} \beta_k \left[\text{exposure}_{ij,t}\right]_{t-T_{\max}=k} + \alpha_{ij} + \gamma_t + \varepsilon_{ijt},$$

where

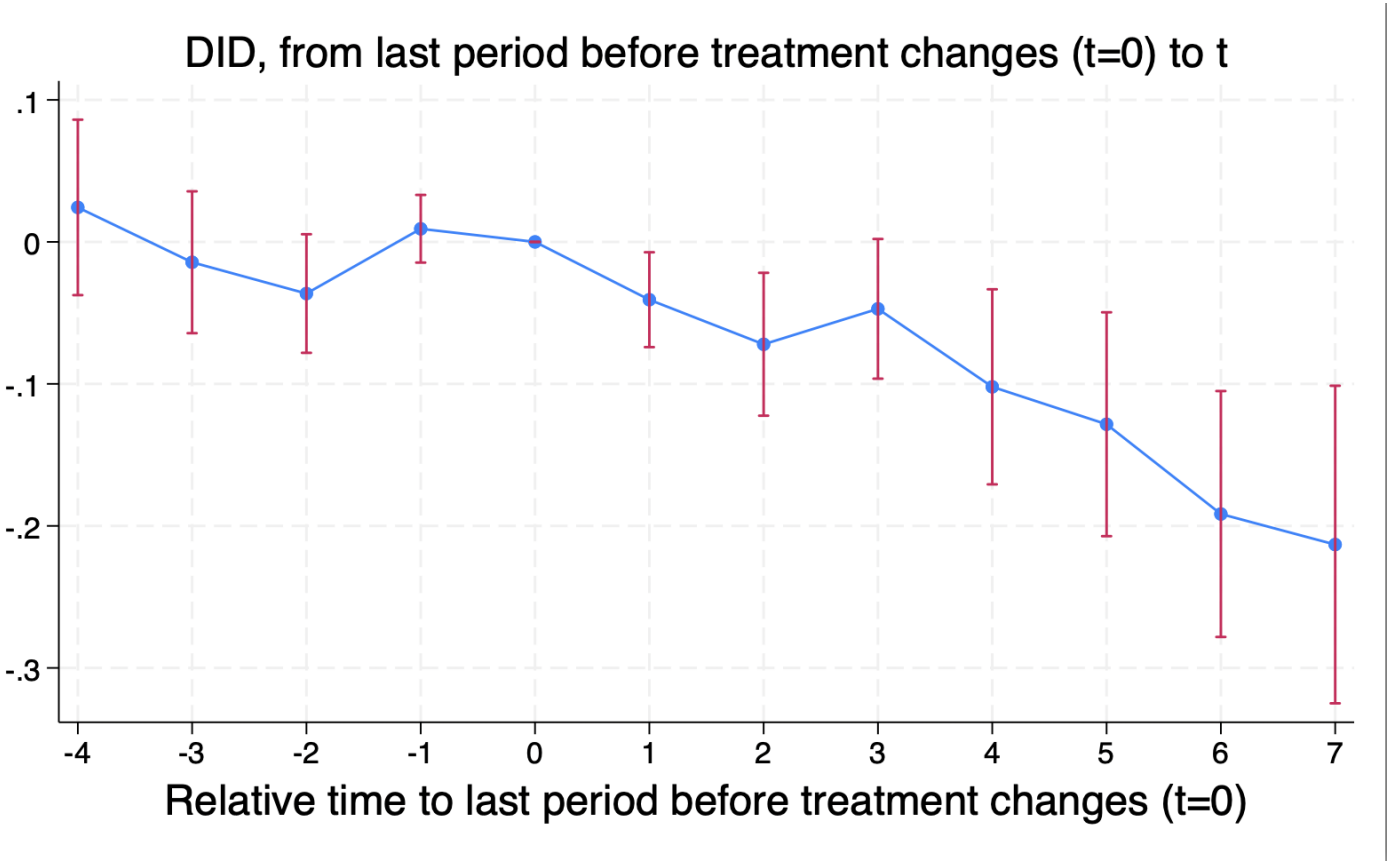
$$\left[\text{exposure}_{ij,t}\right]_{t-T_{\max}=k} = \sum_p D_{p,t}\, \text{port\_rel}_{p,ij} \quad \text{evaluated at } t-T_{\max} = k.$$

- $\alpha_{ij}$: origin–industry fixed effects; $\gamma_t$: year FE.
- $\beta_k$: marginal effect per unit of exposure in event-year $k$.
- No TWFE bias (de Chaisemartin & D'Haultfœuille 2024 dynamic DiD).

# Why Use the de Chaisemartin & D'Haultfœuille Framework?

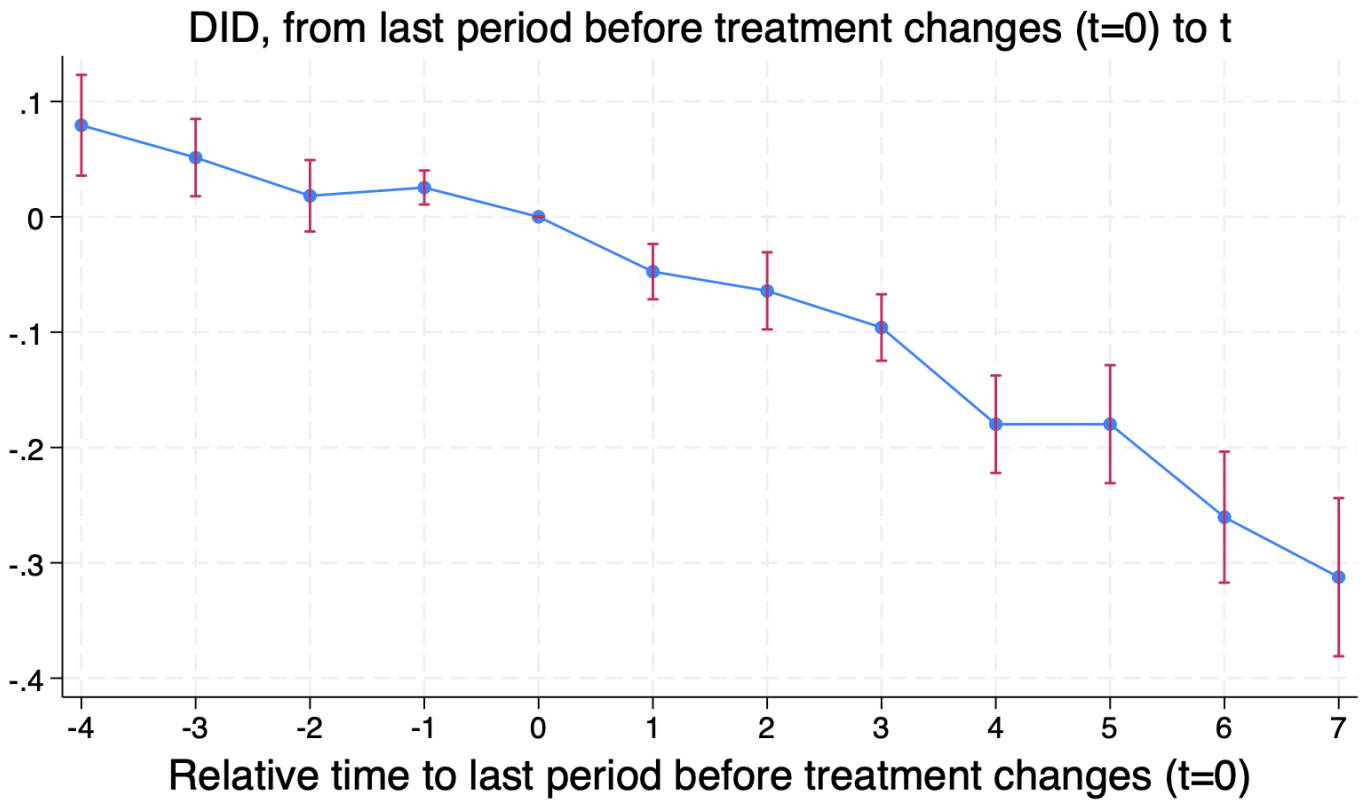
1. **Avoids TWFE bias:** Prevents "negative weights" under staggered timing.
2. **Clean dynamics:** Recovers event-time $\beta_k$ with built-in pre-trend tests.
3. **Handles heterogeneity:** Accommodates different $T_p$ and continuous treatment intensities.
4. **Alternatives:** Sun & Abraham (2021); Callaway & Sant'Anna (2021); shift-share IV (Borusyak et al. 2022).

# Event-Study Results: Log Outbound Trade Dynamics




- Pre-trend ($k < 0$): coefficients near zero, CIs crossing zero.
- Post-treatment ($k \geq 1$): by, regions most exposed to a COSCO acquisition are shipping **20% less outbound volume** in road freight than they would have been, had the port not changed hands.

# Event-Study: Log Inbound Trade Dynamics

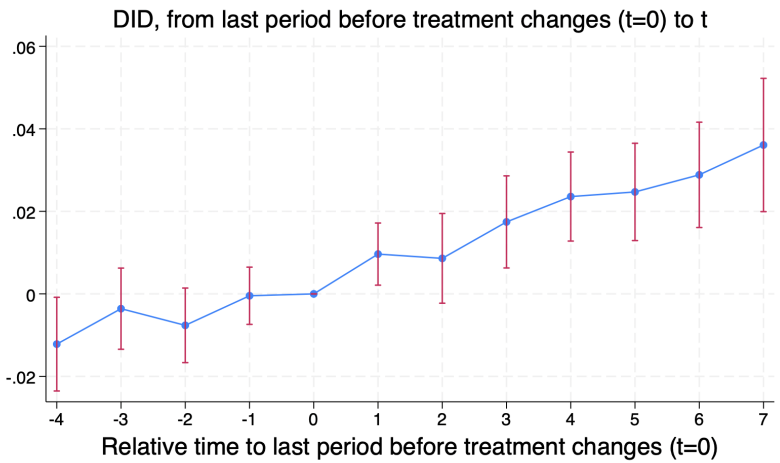



- Less parallel trends support
- Post-treatment: by $k = 7$, regions most exposed to a COSCO acquisition are receiving **30% less inbound volume** in road freight than they would have been, had the port not changed hands.

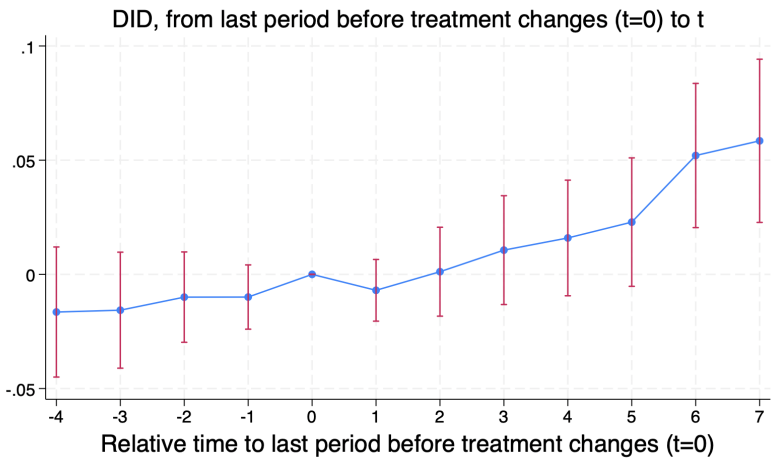
# Event-Study: Loss of Diversity in Trading Partners (HHI)

## Outbound vs. Inbound Partner Concentration

**Outbound HHI**

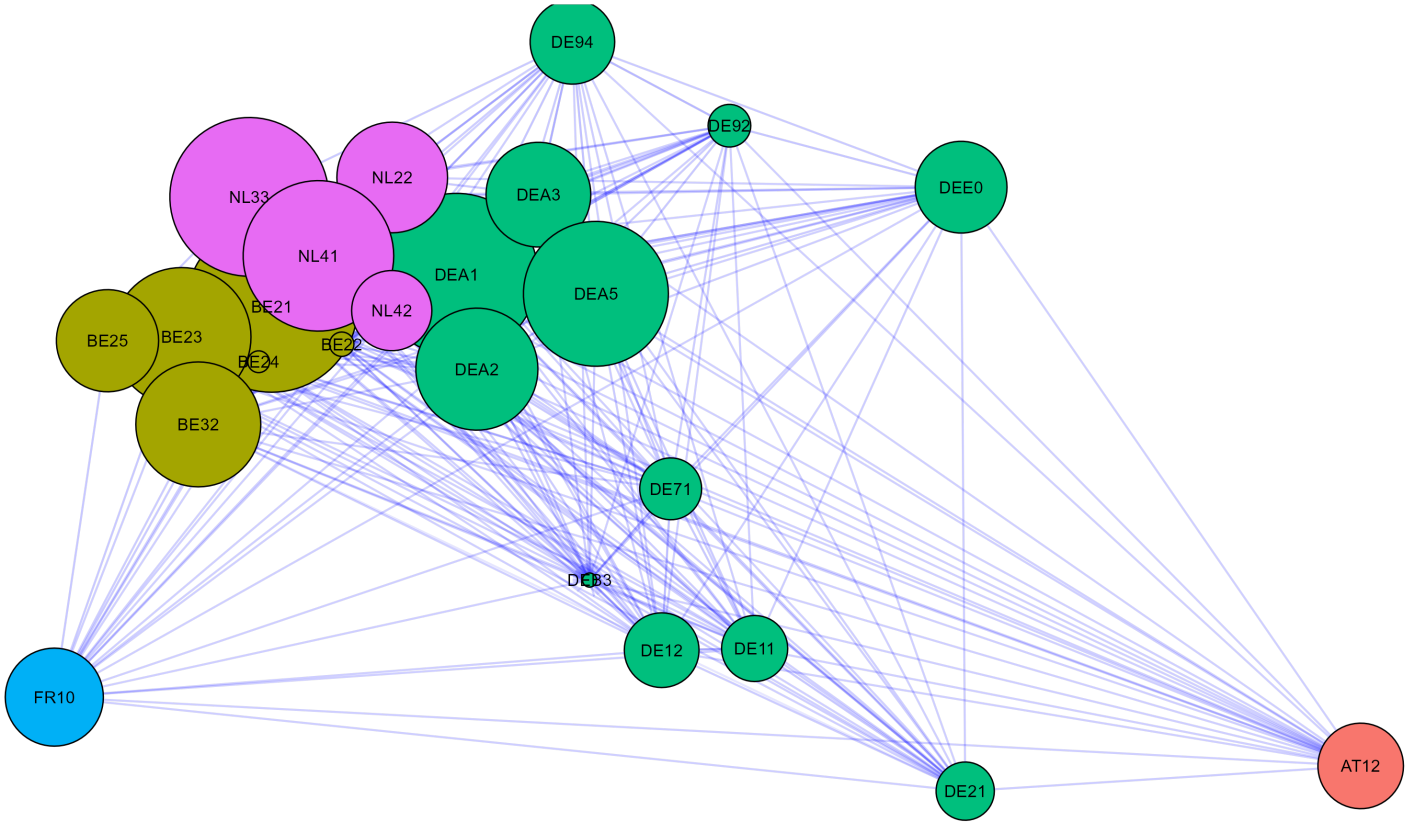



**Inbound HHI**

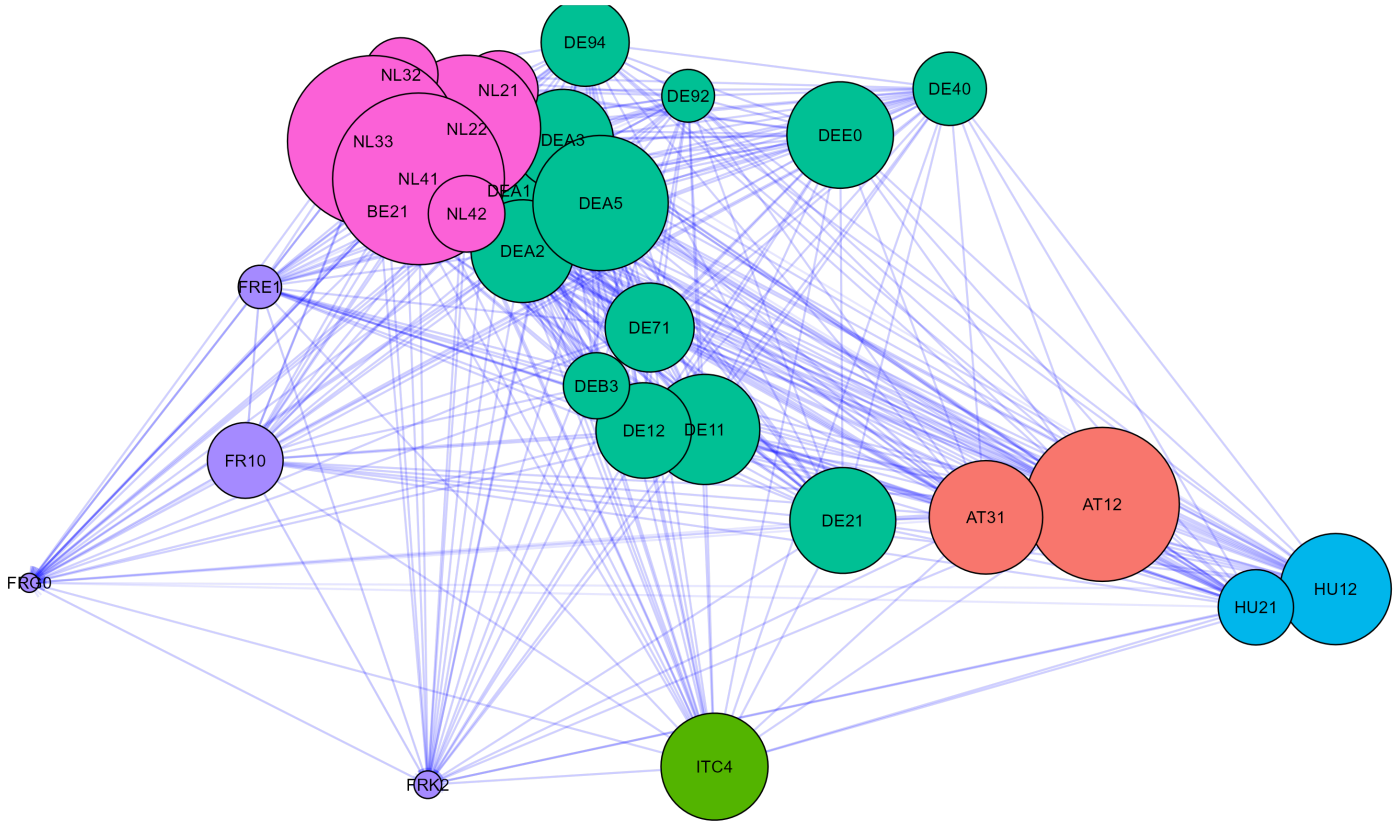



- Both series show flat pre-trends (coefficients 0 for $k < 0$).
- Post-treatment, outbound HHI rises by 4% and inbound by 5% by $k = 7$.
- Loss of trading partners for both inbound and outbound trade.

# Top-Decile Trade Nodes, 2011



# Top-Decile Trade Nodes, 2022



# Degree Centrality "Winners" vs. "Losers" (Top 20)

**Winners (Top20)**

| Region | Name |
|---|---|
| ES64 | Galicia (ES) |
| BG31 | Severozapaden (BG) |
| BG42 | Yugozapaden (BG) |
| HR02 | Zagrebacka (HR) |
| EL42 | Sterea Ellada (GR) |
| ITF2 | Friuli-Venezia Giulia (IT) |
| BG41 | Yugoiztochen (BG) |
| BG34 | Severoiztochen (BG) |
| ITG2 | Sardegna (IT) |
| ITC2 | Nord-ovest (IT) |
| RO41 | Sud-Vest Oltenia (RO) |
| PT18 | Alentejo (PT) |
| EL51 | Makedonia-Thrace (GR) |
| ES43 | Extremadura (ES) |
| ES23 | Andalucía (ES) |
| PT15 | Algarve (PT) |
| BG32 | Severen tsentralen (BG) |
| BG33 | Severoiztochen (BG) |
| SK04 | Vychodné Slovensko (SK) |
| ITG1 | Sicilia (IT) |

**BRI partners:** 16/20 (80%)

**Losers (Top20)**

| Region | Name |
|---|---|
| LI00 | Liechtenstein (LI) |
| UKN0 | Northern Ireland (UK) |
| EE00 | Estonia (EE) |
| EL43 | Crete (GR) |
| NO02 | Hedmark og Oppland (NO) |
| NO04 | Agder-Rogaland (NO) |
| EL61 | Epirus & W. Macedonia (GR) |
| BE10 | Brussels (BE) |
| UKE4 | West Yorkshire (UK) |
| UKD3 | South Yorkshire (UK) |
| UKC1 | East Midlands (UK) |
| RO12 | Centru (RO) |
| SI04 | Zahodna Slovenija (SI) |
| NO03 | Trøndelag (NO) |
| UKI4 | West Midlands (UK) |
| SI03 | Vzhodna Slovenija (SI) |
| DK02 | Midtjylland (DK) |
| UKE1 | Northumberland (UK) |
| UKC2 | West Midlands (UK) |
| NO05 | Vestlandet (NO) |

**BRI partners:** 3/20 (15%)

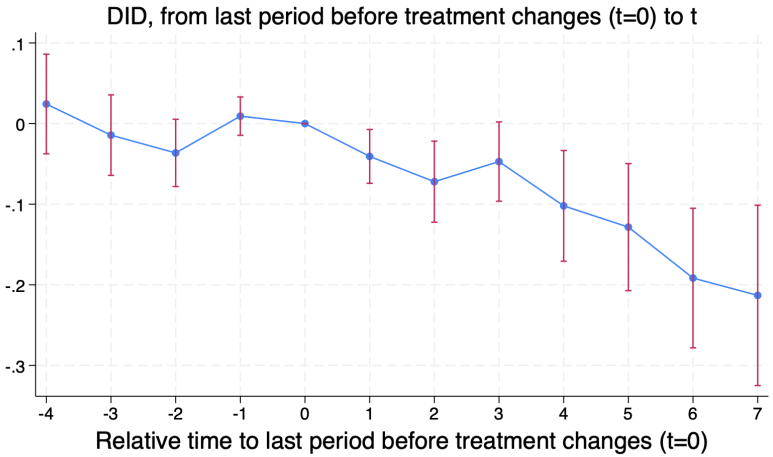
# TEN-T EU Transport Corridors

| # | Corridor | BRI-aligned |
|---|---|---|
| 1 | Baltic–Adriatic Corridor | ✓ |
| 2 | North Sea–Baltic Corridor | ✓ |
| 3 | Mediterranean Corridor | ✓ |
| 4 | Orient/East–Med Corridor | ✓ |
| 5 | Scandinavian–Mediterranean Corridor | × |
| 6 | Rhine–Alpine Corridor | × |
| 7 | Atlantic Corridor | × |
| 8 | North Sea–Mediterranean Corridor | × |
| 9 | Rhine–Danube Corridor | × |

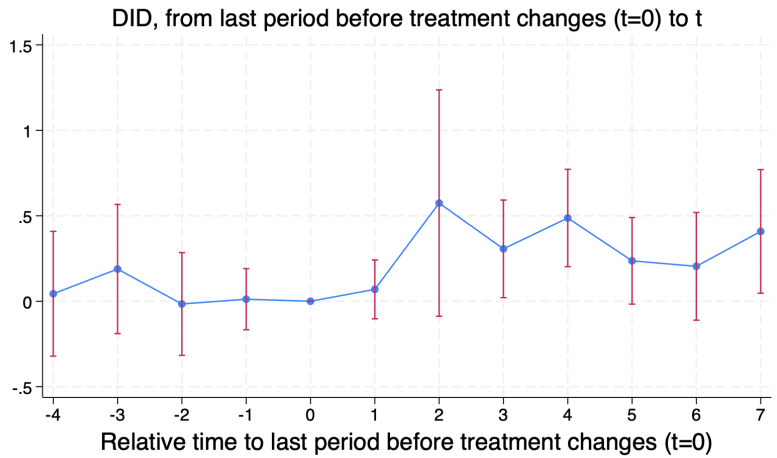
Table: TEN-T Core Corridors and Their Alignment with the Belt and Road Initiative

# Outbound Trade Impact: Western vs. BRI Corridors

## Western-EU Corridors




## BRI-Aligned Corridors




- In **Western-EU corridors**, a 50 pp increase in exposure leads to roughly a $10\%$ drop in outbound trade—in line with the baseline– showing that traditional routes lose volume.
- In **BRI-aligned corridors**, the same exposure increments yield negligible or even positive changes, indicating these routes absorb rerouted flows.
- Similar pattern for inbound trade.
- **Interpretation:** Port takeovers shrink traditional Western hinterlands, while Belt & Road–linked overland networks pick up the slack, rewiring Europe's regional trade geography.

# What's Next (Work in Progress)

- **Spillovers onto regional GDP & labor markets**
  - Estimating how shifts in trade corridors affect local output and employment
- **Network rewiring via alternative transport modes**
  - Mapping whether rail or inland-waterway routes pick up slack when road-freight links shrink
- **Heterogeneous impacts across goods categories**
  - Testing if heavy-machinery industries respond differently than perishables or raw materials
  - Preview: Heterogeneity driven predominantly by 'metal ores and other mining products'

# Key Takeaways

- **Ports as network shocks:** COSCO's staggered acquisitions ripple far beyond the docks
- **Volume drops:** Most exposed regions lose ∼20% of outbound trade, ∼30% of inbound
- **Concentration rises:** HHI increases—trade squeezes into fewer links
- **Winners vs. losers:** 80% of centrality "winners" are in BRI countries along upgraded corridors, while 85% of "losers" lie in non-BRI Western EU regions
- **Corridor divergence:** Western-EU routes see steep declines, BRI-aligned corridors seem to capture rerouted flows and gain connectivity

# Appendix

Table: Share of Total Road-Freight Weight by Goods Type (2011–2022)

| Goods Type | Weight (kg) | Share (%) |
|---|---|---|
| Metal Ores and Mining | 1.30e+09 | 26.61 |
| Non-metal Minerals | 6.00e+08 | 12.29 |
| Food & Beverage | 5.70e+08 | 11.62 |
| Agriculture | 4.60e+08 | 9.28 |
| Grouped Goods | 3.10e+08 | 6.22 |
| Raw Materials | 3.00e+08 | 6.06 |
| Wood/Paper/Media | 2.00e+08 | 4.15 |
| Chemicals | 2.00e+08 | 4.13 |
| Basic Metals | 1.80e+08 | 3.69 |
| Refined Petroleum | 1.60e+08 | 3.17 |
| Transport Materials | 1.00e+08 | 2.13 |
| Machinery | 9.30e+07 | 1.89 |
| Other | 8.70e+07 | 1.76 |
| Transport Equipment | 8.30e+07 | 1.69 |
| Unidentifiable Goods | 7.50e+07 | 1.54 |
| Mail | 6.20e+07 | 1.27 |
| Removals | 4.30e+07 | 0.87 |
| Furniture & Miscellaneous Goods | 3.70e+07 | 0.76 |
| Coal & Petroleum Products | 2.50e+07 | 0.51 |
| Textiles & Leather | 1.80e+07 | 0.36 |

# Event-Study: Metal Ores