All at sea?
Brexit, shipping, and the UK land-bridge

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Introduction
• Transporting goods via Great Britain traditionally a popular route for trade between Ireland and continental Europe, known as UK ‘land-bridge’
• How did Brexit non-tariff trade barriers affect cargo volumes on the land-bridge?
• I explore this using a difference-in-differences analysis of quarterly port-level data

Research questions
1. Was the reduction in trade flows due to Brexit reflected in maritime cargo volumes?
2. Has Brexit caused a diversion of cargo from the UK land-bridge trade route to direct routes?

Methods
Theoretical framework
Firm exporting a good from Ireland to France chooses between road-based land-bridge route, $R$, and the direct short sea shipping route, $S$, to maximise profit:

\[ \text{profit} = \text{revenue} - \text{costs} = \sum_{i,j,t} \left( p_{i,j,t} - c_{i,j,t} \right) q_{i,j,t} \]

where

- $p_{i,j,t}$: price of firm's good
- $c_{i,j,t}$: costs of respective routes
- $q_{i,j,t}$: firm's total factor productivity

\[ \sigma R + \sigma S - \eta R^\tau + \gamma \eta S \]

with

- $\sigma$: constant elasticity of substitution, ease of switching between routes
- $\eta$: parameter on land-bridge route
- $\tau$: constant elasticity of substitution, ease of switching between routes

\[ \text{profit} = \left( \frac{\delta R}{R} \right)^\gamma \left( \frac{\delta S}{S} \right)^{1-\gamma} \]

where

- $\delta R$: cost of the route
- $\delta S$: cost of the route

\[ \frac{\delta R}{R} = (1+\eta) \frac{1}{R} - \frac{\eta}{R} R \]

Study design
Difference-in-differences methodology, comparing average change between 2013 and 2022 in EU-UK cargo volumes with average change in EU global cargo volumes. For first research question:

- Scenario I: UK cargo volumes
- Scenario II: EU global cargo volumes

For second research question:

- Scenario I: Irish cargo volumes
- Scenario II: EU global cargo volumes

Can derive ratio of goods allocated between routes, and model non-tariff trade barriers due to Brexit as an ‘implicit tariff’, $\tau > 0$, on the land-bridge route:

\[ \frac{P_{i,j,t}}{P_{i,j,t}} = \left( \frac{\delta R}{R} \right)^\gamma \left( \frac{\delta S}{S} \right)^{1-\gamma} \]

\[ \gamma \in (0,1); \text{parameter on land-bridge route} \]

\[ \eta \in (0,1); \text{parameter on land-bridge route} \]

\[ \frac{\delta R}{R} = (1+\eta) \frac{1}{R} - \frac{\eta}{R} R \]

Energy consumption and carbon emissions
• Short sea shipping is less energy-intensive than road freight
• Energy intensity of truck around 1.2 mega-joules per tonne-kilometre (MJ/tkm), around 0.7 MJ/tkm for Ro-Ro vessel
• Carbon emissions intensity of truck vs Ro-Ro vessel
• Rough calculation indicates energy consumption and carbon emissions around 60% lower on direct route than on land-bridge

Conclusions
• 27% decrease in EU-UK Ro-Ro cargo volumes due to Brexit
• Ireland-UK Ro-Ro volumes decreased by 34%
• Meanwhile, Ireland-France Ro-Ro volumes increased by 147%
• Energy consumptions and emissions approximately increased by 147%
• But considerable heterogeneity across cargo types

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