

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

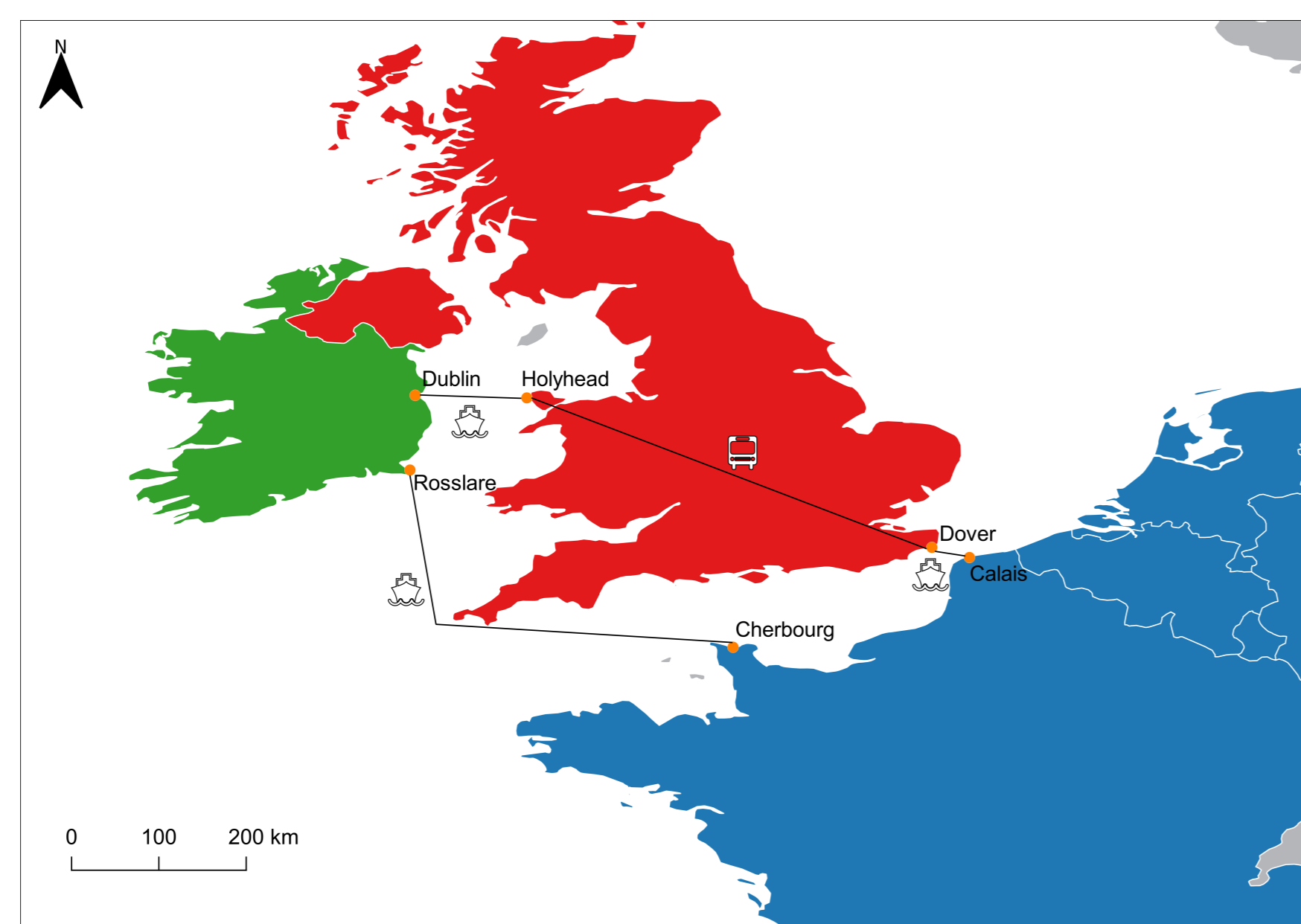


Figure 1: Typical routes for Ireland-France Ro-Ro cargo

Research questions

- Was the reduction in trade flows due to Brexit reflected in maritime cargo volumes?
- 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:

$$\max_{R,S} pA \left(\eta R^{\frac{\sigma-1}{\sigma}} + (1-\eta) S^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} - v_R R - v_S S \quad (1)$$

- v_R, v_S : costs of respective routes
- p : price of firm's good
- A : firm's total factor productivity
- $\eta \in (0, 1)$: share parameter on land-bridge route
- σ : constant elasticity of substitution, ease of switching between routes

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:

$$\frac{R}{S} = \left(\frac{v_S}{v_R(1+\tau)} \right)^{\sigma} \left(\frac{\eta}{1-\eta} \right)^{\sigma} \quad (2)$$

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:

$$weight_{i,j,t} = \exp[\lambda_t + \gamma_j + \delta_{UK} Brexit_{j,t}] + \varepsilon_{i,j,t} \quad (3)$$

For second research question:

$$weight_{i,j,t} = \exp[\lambda_t + \gamma_j + \delta_{UK} Brexit_{j,t} + \delta_{FR} France_{j,t}] + \varepsilon_{i,j,t} \quad (4)$$

- Outcome variable $weight_{i,j,t}$: weight of goods transported to/from port i , to/from partner country j , in quarter-year t
- λ_t : quarter-year fixed effect
- γ_j : partner country fixed effect
- δ : treatment coefficients
- $Brexit_{j,t} = 1$ if partner was UK and period was 2021 Q1 or later
- $France_{j,t} = 1$ if partner was France and period was 2021 Q1 or later

Regression models estimated using **pseudo-Poisson maximum likelihood (PPML)** estimator.

Data

- Gross weight of goods through European ports by direction, cargo type and partner country
- Eurostat, quarterly 2013-2022
- EU-27 ports for Equation 3, Irish ports for Equation 4
- 4 main cargo types: liquid bulk, dry bulk, large containers (Lo-Lo) and roll on roll off (Ro-Ro)



Figure 2: Large containers (Lo-Lo)



Figure 3: Roll on roll off (Ro-Ro)

Results

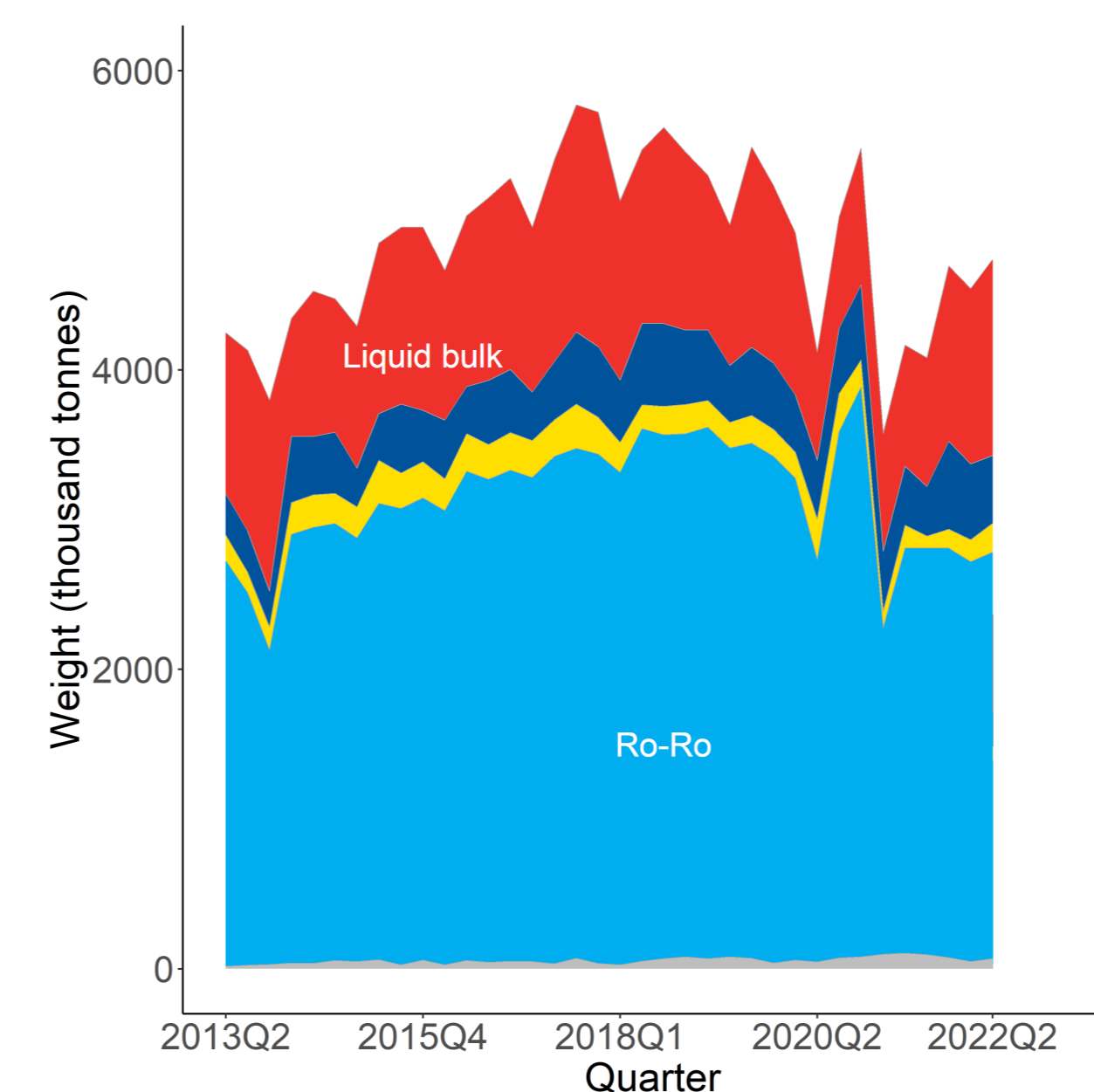


Figure 4: Cargo volumes by cargo type, Irish ports with UK as partner country 2013-2022. Ireland-UK cargo mostly liquid bulk or Ro-Ro

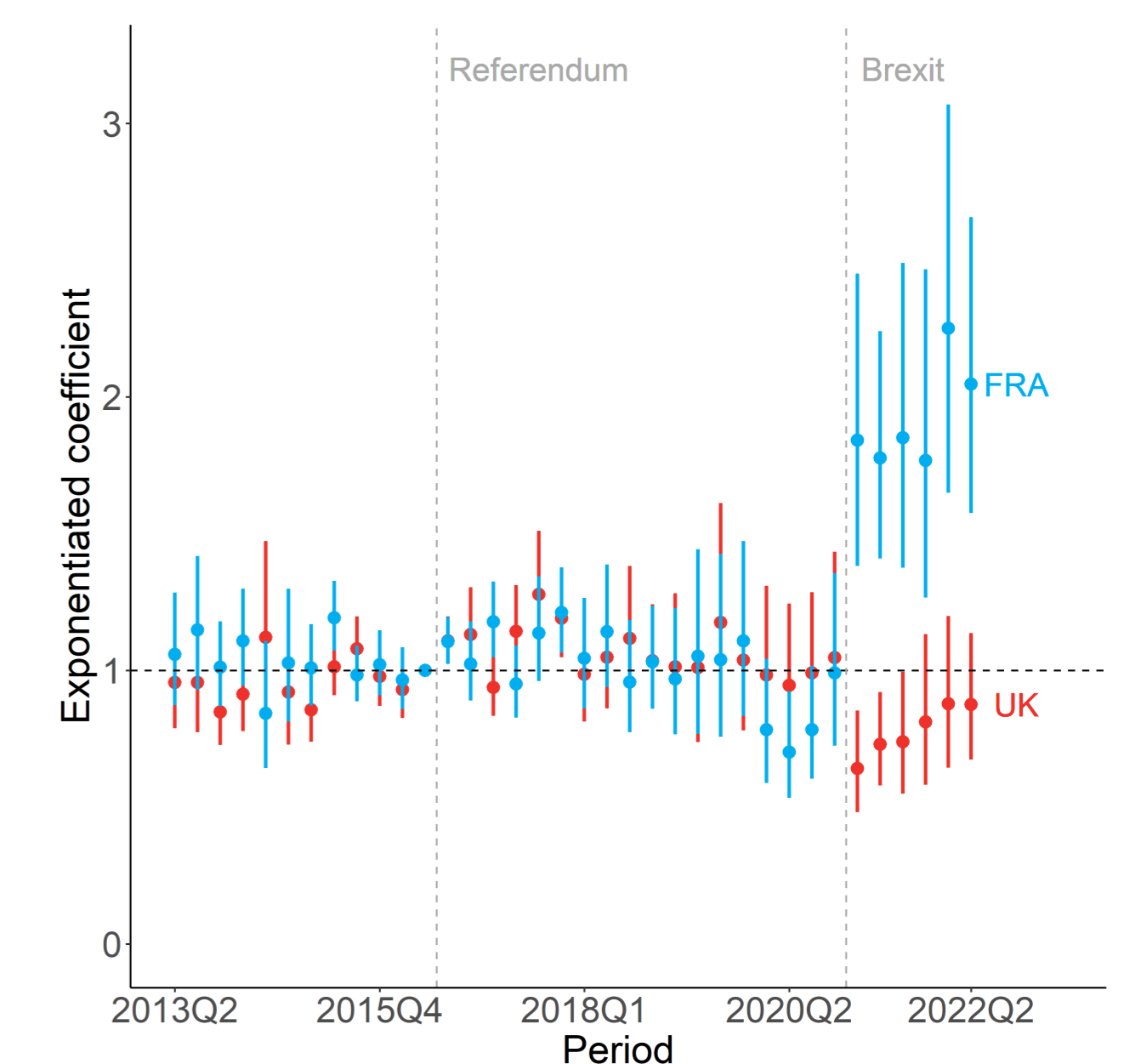


Figure 5: Exponentiated coefficients and 95% confidence intervals, Brexit effect on total cargo volumes, Irish ports, treatment leads and lags 2013-2022

	(1)	(2)	(3)	(4)	(5)
	Total	Liquid bulk	Dry bulk	Lo-Lo	Ro-Ro
UK post-Brexit	1.03 (0.02)	1.03 (0.05)	1.10** (0.05)	1.54*** (0.03)	0.79*** (0.02)
Observations	592,164	249,408	321,012	3000,636	133,128
Fixed effects	Yes	Yes	Yes	Yes	Yes

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Robust standard errors clustered at partner country level in parentheses.

Table 1: Exponentiated coefficients, Brexit effect on cargo volumes, EU ports (see Equation 3)

- Brexit dealt heavier blow to cargo volumes in **Irish ports**
- Total cargo volumes decreased by 24% due to Brexit
- However, also caused an 88% increase in Ireland-France total cargo volumes
- Mostly Ro-Ro**; 54% decrease in Ireland-UK volumes, 147% increase in Ireland-France volumes

	(1)	(2)	(3)	(4)	(5)
	Total	Liquid bulk	Dry bulk	Lo-Lo	Ro-Ro
UK post-Brexit	0.76*** (0.06)	0.84 (0.19)	1.08 (0.12)	0.50*** (0.04)	0.46*** (0.03)
France post-Brexit	1.88*** (0.15)	0.79 (0.18)	0.89 (0.09)	1.06 (0.08)	2.47*** (0.14)
Observations	9,972	3,708	7,020	2,592	2,736
Fixed effects	Yes	Yes	Yes	Yes	Yes

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$. Robust standard errors clustered at partner country level in parentheses.

Table 2: Exponentiated coefficients, Brexit effect on cargo volumes, Irish ports (see Equation 4)

Energy consumption and carbon emissions

- Short sea shipping is **less energy-intensive** than road freight
- Energy intensity of truck around 1.2 megajoules per tonne-kilometre (MJ/tkm), around 0.7 MJ/tkm for Ro-Ro vessel
- Carbon emissions intensity of truck 83.1 grams per tonne-kilometre (g/tkm), 36.3 g/tkm for Ro-Ro vessel
- Rough calculation indicates energy consumption and carbon emissions **around 60% lower** on direct route than on land-bridge

Stage	Distance (km)	Energy (MJ)	Emissions (g)
<i>Land-bridge route:</i>			
Dublin (IRL)			
Holyhead (UK)	113	64	4,100
Dover (UK)	600	720	49,860
Calais (FRA)	40	23	1,451
Total	753	807	55,411
<i>Direct route:</i>			
Dublin (IRL)			
Cherbourg (FRA)	600	342	21,771
Total	600	342	21,771

Conclusions

- 27% decrease** in EU-UK Ro-Ro cargo volumes due to Brexit
- Ireland-UK Ro-Ro volumes **decreased by 54%**
- Meanwhile, Ireland-France Ro-Ro volumes **increased by 147%**
- Energy consumptions and emissions approximately **60% lower** on direct short sea shipping route than on land-bridge
- Land-bridge result highly context-specific... but, general lesson: could **target transit times** to promote short sea shipping over road freight

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