Not To Belittle NTBs: Non-Tariff Barriers and Trade During Brexit

Rebecca Freeman (BoE)

Marco Garofalo (BoE & Oxford)

Enrico Longoni (BoE)

Rebecca Mari (BoE)

Kalina Manova (UCL)

Thomas Prayer (LSE)

Thomas Sampson (LSE)

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Brexit & trade

- UK's vote to leave the EU signalled start of a wave of economic disintegration
- Brexit increased UK-EU trade costs by raising first trade policy uncertainty and ultimately non-tariff barriers (NTBs), but not tariffs
- Study Brexit's impact on UK firms to assess how NTBs affect trade
  - How do NTBs impact firm exports?
  - How do NTBs shape firm imports with global sourcing?
  - Do NTBs operate as fixed or variable costs?

Brexit timeline

- June 2016: UK votes 52% to 48% in favour of leaving EU
  - Referendum did not specify when Brexit would occur or what form post-Brexit relationship with EU would take
  - Wide range of alternatives: e.g. stay in single market or customs union, sign preferential trade agreement, trade on WTO terms
- March 2017: UK notifies EU of intention to leave. Exit negotiations have 2-year deadline, but are extended 3 times during 2019
- 31^{st} January 2020: UK leaves EU, but economic relationship remains unchanged while new deal is negotiated
- 1^{st} January 2021: UK leaves EU's single market and customs union. Trade and Cooperation Agreement begins to govern UK-EU relations

Trade and Cooperation Agreement (TCA)

- TCA puts zero tariffs and zero quotas on all UK-EU trade
- But leaving single market and customs union has nevertheless led to higher NTBs
- New non-tariff barriers under TCA
  - Customs formalities: paperwork and border checks
  - Rules of origin requirements: supply chain management and paperwork
  - Regulatory barriers: no automatic market access
  - Labour mobility restrictions: no right to work abroad
- UK gradually phasing in checks on imports from EU, whereas EU checks on UK exports quickly implemented

This paper

- How has bundle of NTBs due to TCA affected UK goods trade?
  - Firm-level customs data 2012-21
  - Differential impact on EU vs rest of world (RoW) exports & imports within firms
  - (In progress) Impact on firms' global and regional exports & imports of pre-referendum exposure to EU trade and global value chain linkages
- (In progress) How has TCA affected UK services trade?
  - Services vs goods comparison
  - Services-goods interlinkages

Key findings

- TCA reduced exports to EU relative to RoW by 13% for average exporter in our data
  - Export decline driven by smaller firms. No effect for large firms
  - Fall in relative EU exports is 19% at 25^{th} percentile of employment, 6% at 75^{th} percentile, non-negative above 85^{th} percentile
  - Data limitations preclude extensive margin analysis
- TCA reduced EU relative to RoW imports by 28% for average importer
  - Import effect similar across firm size distribution
  - Fall in imports driven by extensive margin exit of product-country origins within importers

Overview

1. Data
2. Empirical strategy
3. Aggregate trade
4. Baseline estimates
5. Firm heterogeneity
6. Intensive vs extensive margin

Data

- HMRC customs data at firm (VAT number)-CN 8 digit product-partner country-month level in 2012-21
- Match trade data with firm characteristics from VAT data and IDBR: employment, turnover, sales, input purchases
- Data on UK exports to EU switches from Intrastat survey to customs declarations in 2021
  - Northern Ireland export data still collected via Intrastat
- Import data does not switch from Intrastat to customs declarations until 2022

EU export data: Intrastat vs customs declarations

- 2012-20: Intrastat only includes VAT registered businesses whose total exports to EU exceed £250,000 threshold
  - Only relatively large exporters observed
  - Threshold chosen to capture at least 97% of exports, but only observe around 1/4 of exporters
- 2021: Switch to customs declarations increases coverage of exporters
  - Observe below Intrastat threshold exporters, non-VAT registered businesses and private individuals
  - Export transactions below £873 are not allocated to individual firms, but count towards aggregates
  - ONS estimates $\approx 5\%$ higher measured exports to EU due to switch
- Firms' export product scope to EU appears inconsistent between Intrastat & customs declarations data
  - Do not study export product margin

Sample

- Exports: firms that export to both EU & RoW, $\approx 25,000$ firms
- Imports: firms that import from both EU & RoW, $\approx 15,000$ firms
- Baseline clean sample excludes (robust to alternatives):
  - Export observations below £2,500 at firm-CN8 product-country-month level (due to £873 threshold in 2021)
  - Exporters only observed in 2021
  - International trade to/from customs warehouses and free zones, i.e. use 'special trade'
  - Non-monetary gold

Estimation strategy

Study evolution of UK trade along Brexit timeline using event studies and diff-in-diff specifications

- Within-firms: compare changes in EU vs RoW trade
- Across-firms: compare changes in trade across firms with different exposure to EU trade before Brexit referendum
- 3 time periods: pre-referendum (2012Q1-2016Q2), post-referendum (2016Q3 onwards), TCA (2021Q1 onwards)
- Control for import demand and export supply shocks in partner countries using their trade with world excluding UK

Event study

$$\log V_{frt} = \sum_t \beta_t EU_r + \alpha_{fr} + \alpha_{ft} + \alpha_{rs} + \gamma X_{frt} + \epsilon_{frt}$$

- V_{frt}: exports (or imports) of firm f to region r (EU or RoW) in quarter t
- α_{fr}, α_{ft}, α_{rs}: firm-region, firm-time, region-season fixed effects
- X_{frt}: import demand (export supply) in r, real exchange rate variation, UK MFN tariff changes
  - Aggregated to firm-region level using firm-CN8 product-country start-of-sample export (import) weights
- Standard errors clustered by firm

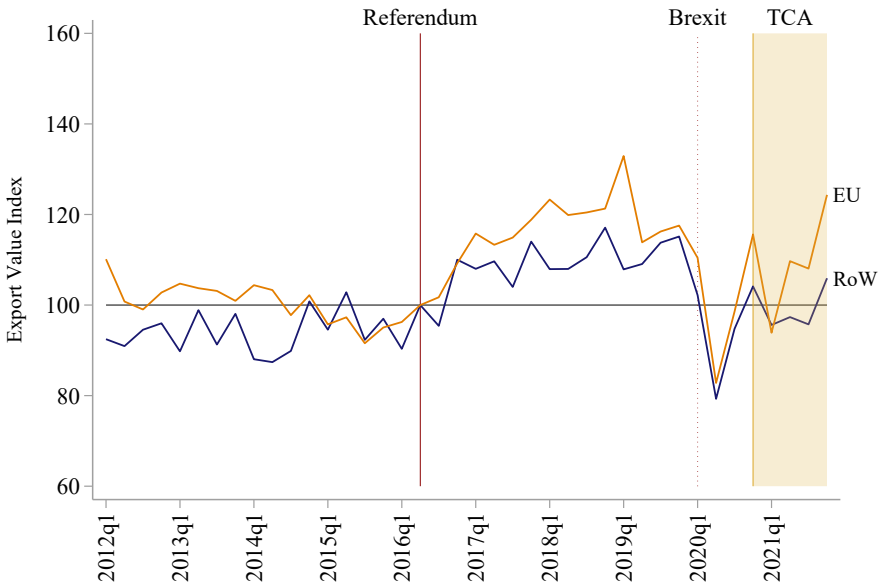
Controls

Diff-in-diff

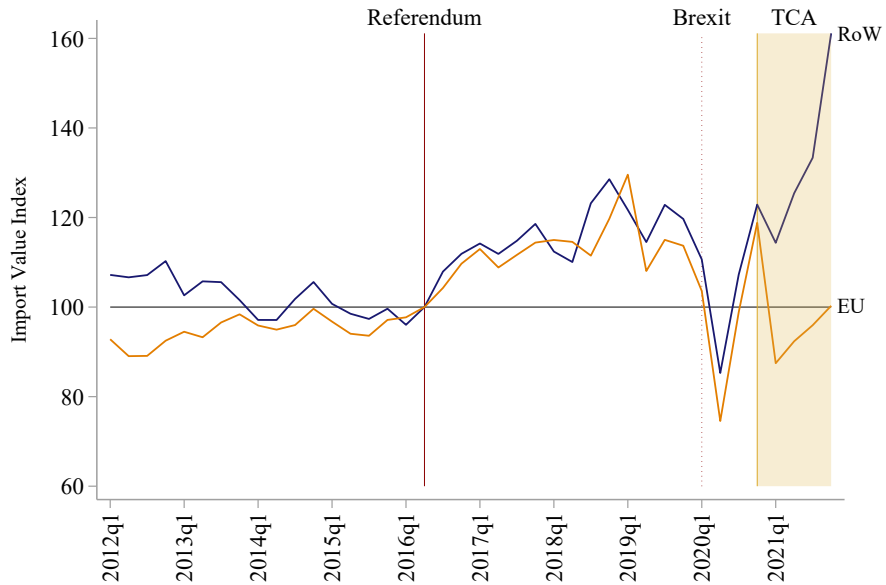
$$\log V_{frt} = \beta_1 Referendum_t EU_r + \beta_2 TCA_t EU_r + \beta_3 StartTCA_t EU_r + \beta_4 Covid_t EU_r + \alpha_{fr} + \alpha_{ft} + \alpha_{rs} + \gamma X_{frt} + \epsilon_{frt}$$

- $Referendum_t$ post-Brexit referendum dummy, 2016Q3 onwards
- TCA_t post-introduction of TCA dummy, 2021Q1 onwards
- $StartTCA_t$ dummy for 2021Q1 when trade disrupted by start of TCA
- $Covid_t$ dummy for start of Covid-19 pandemic, 2020Q1 and 2020Q2

Aggregate trade flows (HMRC Overseas Trade Statistics)



Exports

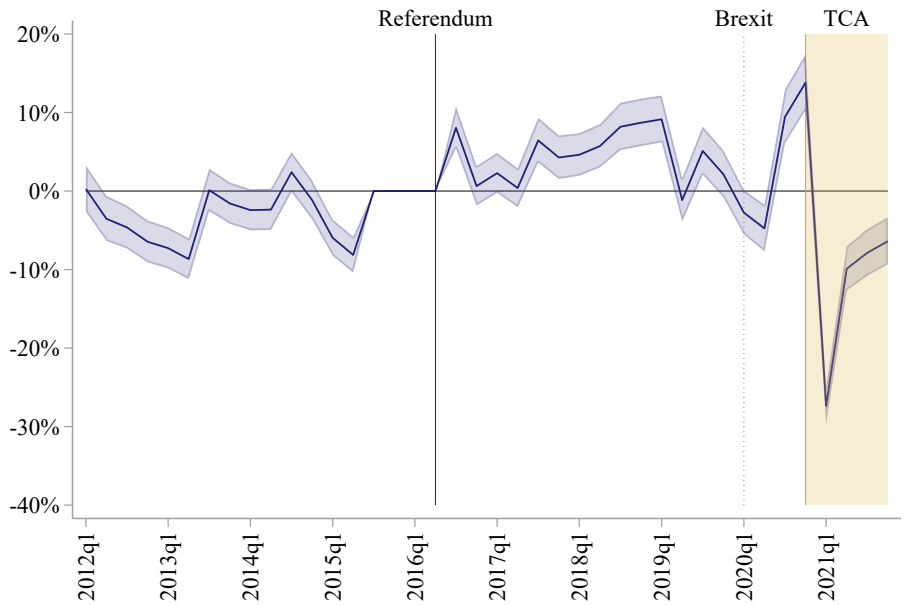


Imports

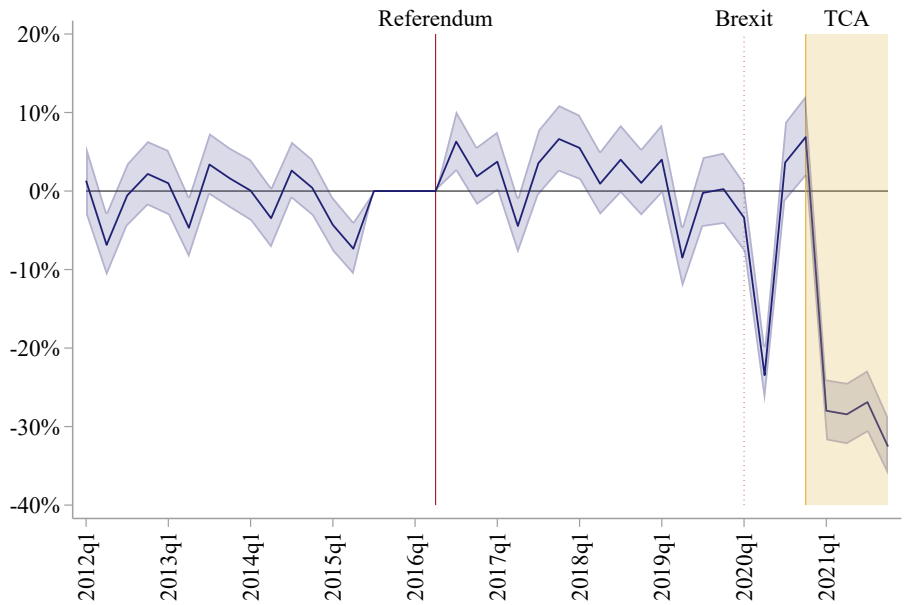
- After referendum before TCA: similar export and import trends with EU & RoW
- Quick Covid-19 collapse and recovery across all trade flows
- After TCA: similar trends in UK exports to EU & RoW, larger drop in UK imports from EU relative to RoW

Our sample | Aggregate vs our sample

Firm-level event study, EU vs RoW (no controls)



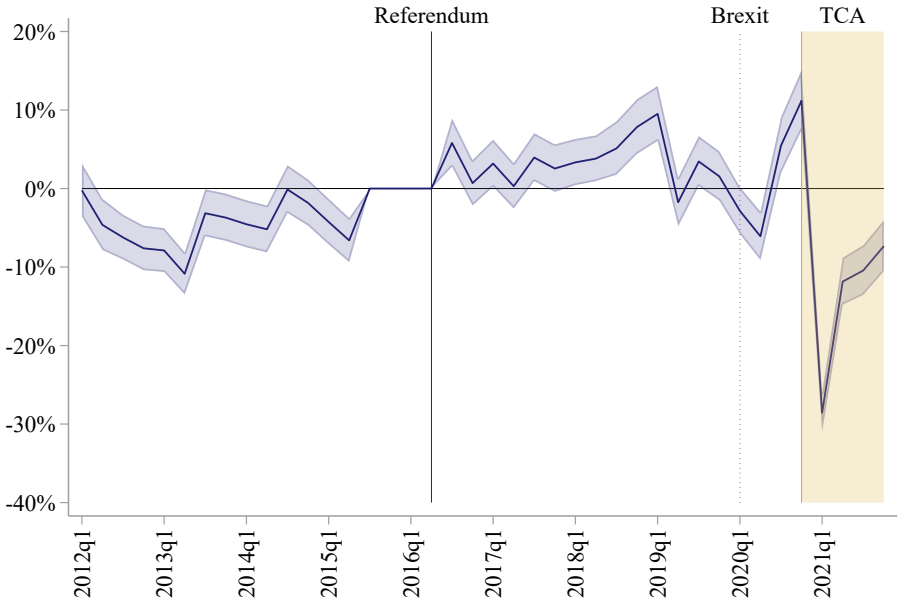
Exports



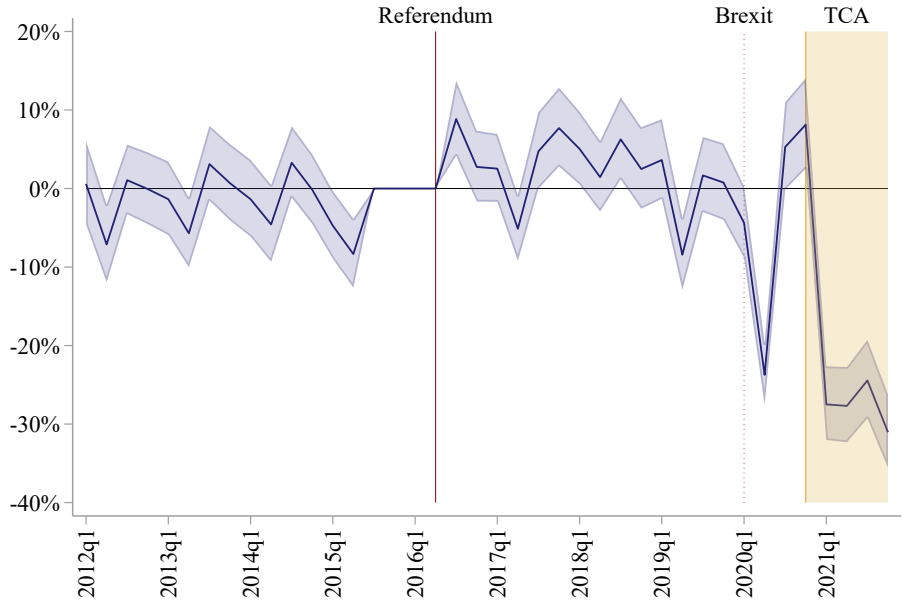
Imports

- No evidence of trade diversion away from EU before 2021
- TCA led to fall in EU relative to RoW trade within firms, particularly for imports

Firm-level event study, EU vs RoW (with controls)



Exports



Imports

- Results robust to controlling for import demand and export supply shocks in partner countries

Firm exports: diff-in-diffs

	(1)	(2)	(3)	(4)	(5)
	Alternative fixed effects			Keep low value trade	Baseline
Referendum*EU	0.10	0.06	0.07	0.07	0.05
	(0.010)	(0.008)	(0.008)	(0.007)	(0.015)
StartTCA*EU	-0.11	-0.12	-0.25	-0.22	-0.24
	(0.013)	(0.012)	(0.012)	(0.010)	(0.011)
TCA*EU	-0.33	-0.15	-0.13	-0.16	-0.14
	(0.012)	(0.011)	(0.011)	(0.010)	(0.011)
R^2	0.66	0.82	0.92	0.93	0.93
N	953,760	953,760	953,760	1,029,966	999,450
Controls					
Covid	✓	✓	✓	✓	✓
Firm-Level					✓
Region-Level					✓
Fixed Effects					
Firm	✓				
Region	✓				
Time	✓	✓			
Firm-Region		✓	✓	✓	✓
Firm-Time			✓	✓	✓
Region-Season			✓	✓	✓

Notes: Dependent variable is log exports by firm-region-quarter. Standard errors clustered by firm in parentheses. In column (4) observations below £2,500 are not dropped when calculating total firm-level exports by region-quarter.

Firm imports: diff-in-diffs

	Alternative fixed effects			Baseline
	(1)	(2)	(3)	(4)
Referendum*EU	0.16	0.02	0.02	0.02
	(0.017)	(0.012)	(0.013)	(0.019)
StartTCA*EU	-0.06	-0.00	-0.02	-0.04
	(0.023)	(0.018)	(0.019)	(0.020)
TCA*EU	-0.17	-0.36	-0.35	-0.32
	(0.023)	(0.019)	(0.019)	(0.025)
R^2	0.58	0.83	0.93	0.93
N	559,626	559,626	559,626	567,534
Controls				
Covid	✓	✓	✓	✓
Firm-Level				✓
Region-Level				✓
UK Global Tariff				✓
Fixed Effects				
Firm	✓			
Region	✓			
Time	✓	✓		
Firm-Region		✓	✓	✓
Firm-Time			✓	✓
Region-Season			✓	✓

Notes: Dependent variable is log imports by firm-region-quarter. Standard errors clustered by firm in parentheses.

Results summary

- Uncertainty and anticipation effects did not reduce firm-level trade with EU relative to RoW between 2016 and 2020
- TCA reduced firm-level trade with EU relative to RoW for both exports and imports
- Estimated TCA effect larger for imports than for exports
- Baseline diff-in-diff estimates imply TCA reduced firm-level trade with EU relative to RoW by:
  - 13% for exports
  - 28% for imports

Heterogeneity across firms

Does impact of TCA on trade depend upon firm size?

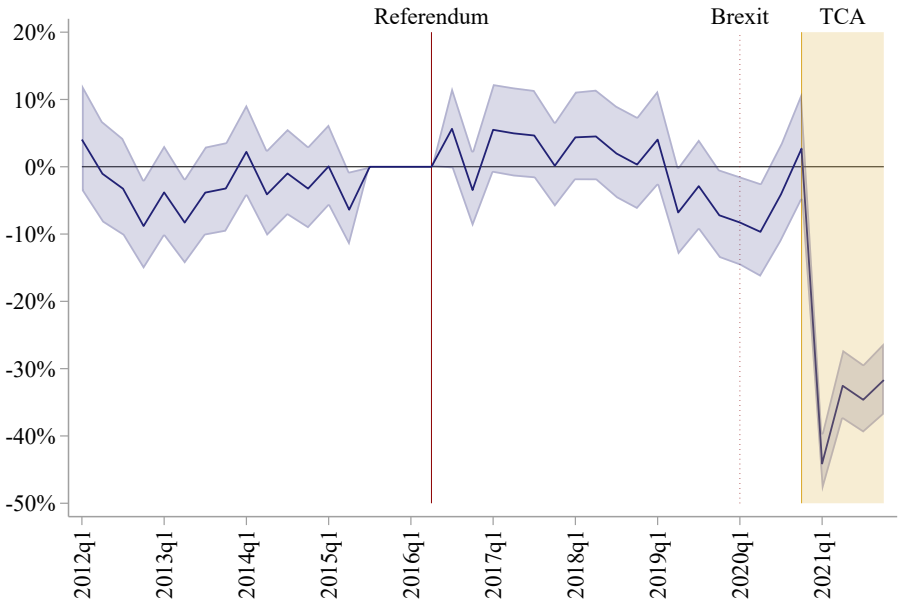
- Interact referendum, TCA and Covid effects with firm size
- Proxy firm size with log employment averaged over 2013-15

Firm heterogeneity: diff-in-diff

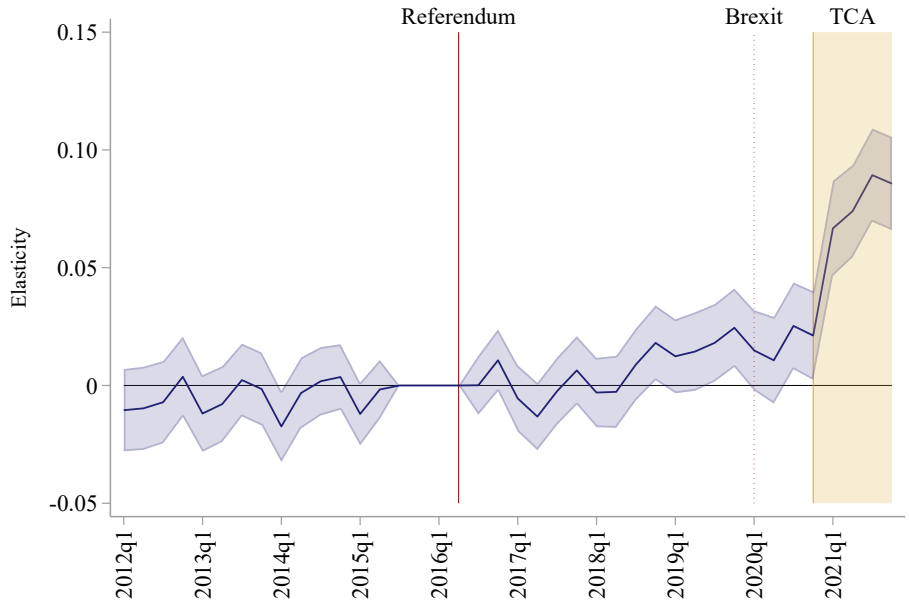
	Exports		Imports	
	(1)	(2)	(3)	(4)
Referendum*EU	0.05	0.00	0.02	-0.10
	(0.015)	(0.025)	(0.019)	(0.038)
StartTCA*EU	-0.24	-0.19	-0.04	-0.07
	(0.011)	(0.023)	(0.020)	(0.055)
TCA*EU	-0.13	-0.41	-0.32	-0.39
	(0.011)	(0.028)	(0.025)	(0.055)
Firm Size*Referendum*EU		0.01		0.03
		(0.005)		(0.008)
Firm Size*StartTCA*EU		-0.02		0.01
		(0.006)		(0.011)
Firm Size*TCA*EU		0.07		0.02
		(0.008)		(0.011)
R^2	0.93	0.93	0.93	0.93
N	971,114	971,114	542,178	542,178
Controls				
Covid	✓	✓	✓	✓
Firm-Level	✓	✓	✓	✓
Region-Level	✓	✓	✓	✓
UK Global Tariff			✓	✓
Fixed Effects				
Firm-Region	✓	✓	✓	✓
Firm-Time	✓	✓	✓	✓
Region-Season	✓	✓	✓	✓

Notes: Dependent variable is log exports or imports by firm-region-quarter. Firm size measured by log employment averaged over 2013-15. Standard errors clustered by firm in parentheses.

Firm heterogeneity: exports event study

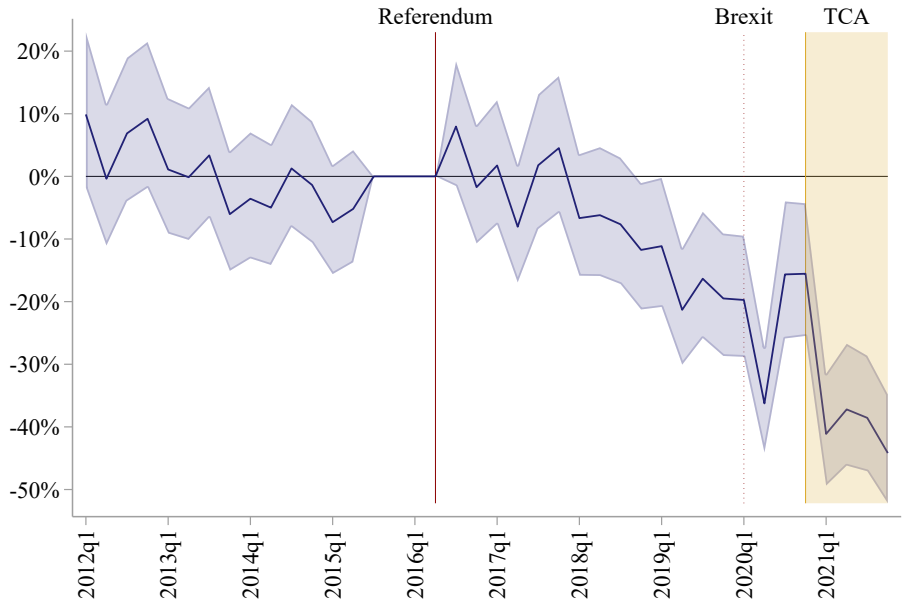


Level effect

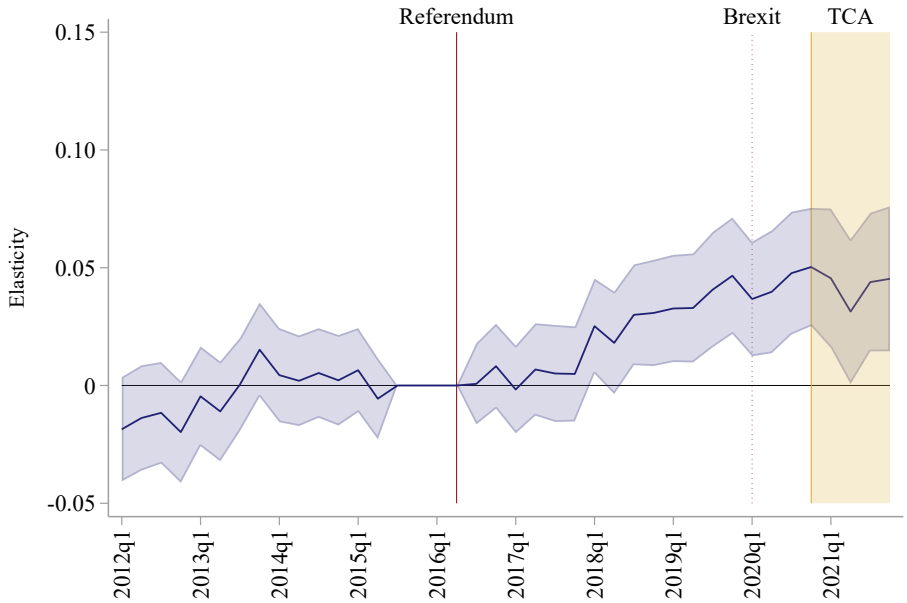


Firm size interaction

Firm heterogeneity: imports event study



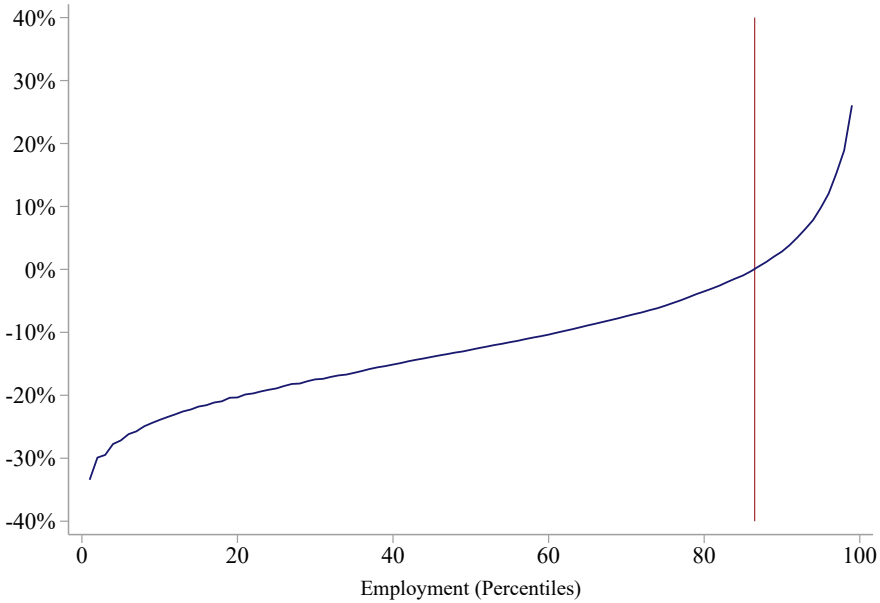
Level effect



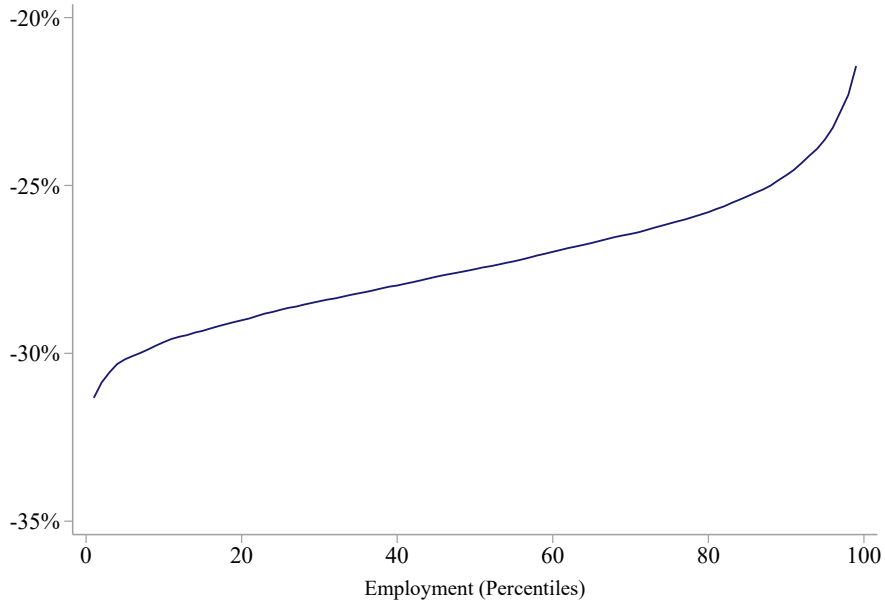
Firm size interaction

- Small firms may have started to reduce imports from EU relative to RoW in 2018 and 2019

TCA effect by firm size



Exports



Imports

- Median exporter: employment $= 38$, TCA effect $= -13\%$
- Export effect negative for firms below 85^{th} percentile, i.e. employment < 200
- Median importer: employment $= 79$, TCA effect $= -27\%$

Details

Intensive vs extensive margin

- Decompose trade into intensive and extensive margins

$$\log V_{frt} = \log N_{frt} + \log Z_{frt}$$

- N extensive margin: number of varieties traded with region r by firm f in quarter t
- Z intensive margin: average trade per variety
- Count varieties using countries, CN-8 digit products, or country-product pairs
  - Use product dimension for imports only because of data limitations
- Use variety counts to estimate effect of TCA on extensive margins of trade

Firm-level intensive vs extensive margin: exports

	Region level	Country level		
	Baseline	Intensive	Intensive: no PTAs	Extensive
	(1)	(2)	(3)	(4)
Referendum*EU	0.05	0.09	0.06	0.01
	(0.015)	(0.005)	(0.006)	(0.007)
TCA*EU	-0.14	-0.10	-0.11	-0.04
	(0.011)	(0.009)	(0.010)	(0.005)
R^2	0.93	0.80	0.81	0.93
N	999,450	5,943,829	5,088,693	1,013,558
Controls				
Covid & Start TCA	✓	✓	✓	✓
Firm-Level	✓	✓	✓	✓
Region-Level	✓	✓	✓	✓
Fixed Effects				
Firm-Region	✓			✓
Firm-Time	✓	✓	✓	✓
Region-Season	✓			✓
Firm-Country		✓	✓	
Country-Season		✓	✓	

Notes: Dependent variable is firm-quarter log exports by region in column (1) and by country in columns (2) and (3). Dependent variable is firm-region-quarter log count of countries exported to in column (4). Products defined at CN8-digit level. Country sample in column (3) excludes countries in rest of world that have PTA with UK. Standard errors clustered by firm in parentheses.

Event study

Firm-level intensive vs extensive margin: imports

	Region level	Country level			Country-product level	
	Baseline	Intensive	Intensive: no PTAs	Extensive	Intensive	Extensive
	(1)	(2)	(3)	(4)	(5)	(6)
Referendum*EU	0.02	0.04	0.04	0.05	0.07	0.10
	(0.019)	(0.011)	(0.012)	(0.007)	(0.036)	(0.010)
TCA*EU	-0.32	-0.20	-0.14	-0.12	-0.08	-0.18
	(0.025)	(0.017)	(0.017)	(0.008)	(0.047)	(0.013)
R^2	0.93	0.84	0.85	0.93	0.90	0.96
N	567,534	3,984,135	3,408,988	571,652	9,384,183	571,652
Controls						
Covid & StartTCA	✓	✓	✓	✓	✓	✓
Firm-Level	✓	✓	✓	✓	✓	✓
Region-Level	✓	✓	✓	✓	✓	✓
UK Global Tariff	✓	✓	✓	✓	✓	✓
Fixed Effects						
Firm-Region	✓			✓		✓
Firm-Time	✓	✓	✓	✓		✓
Region-Season	✓			✓		✓
Firm-Country		✓	✓			
Country-Season		✓	✓			
Firm-Product-Country					✓	
Firm-Product-Time					✓	
Product-Country-Season					✓	

Notes: Dependent variable is firm-quarter log imports by region in column (1), by country in columns (2) and (3), and by country-product in column (4). Dependent variable is firm-region-quarter log count of countries imported from in column (4) and country-products imported in column (6). Products defined at CN8-digit level. Country sample in column (3) excludes countries in rest of world that have PTA with UK. Standard errors clustered by firm in parentheses.

Event studies

Aggregate extensive margin: number of firms

- Data constraints prevent us from measuring how number of firms trading with EU changes under TCA
- UK Trade in Goods by Business Characteristics dataset
  - Exporters to EU fell from $\approx 121,000$ in 2019 to $\approx 100,000$ in 2021
  - Decline fully accounted for by fall in exporters with fewer than 10 employees from $\approx 70,000$ to $\approx 46,000$
- No data available on number of importers from EU under TCA

Conclusions

- Exports
  - TCA reduced exports to EU relative to RoW for small and medium sized firms, but not for large firms
  - Aggregate data does not show relative decline in exports to EU under TCA because:
    1. Large firms account for most export value
    2. Switch from Intrastat to customs declarations increased measured exports to EU
- Imports
  - Larger fall for imports than for exports, with less heterogeneity across firm size distribution
  - Import effect driven mainly by extensive margin exit from EU at product-country level
- Estimates consistent with TCA primarily increasing fixed trade costs

Ongoing research

- Why do our estimates differ for imports vs exports?
  - Import sourcing decisions are interdependent across origins $\Rightarrow$ Firms substitute from EU to RoW imports when trade costs increase
  - EU market larger than UK market $\Rightarrow$ UK exporters willing to pay higher fixed export costs under TCA, but EU exporters are not
- How has TCA affected level of UK trade?
  - Have higher trade barriers with EU diverted exports or imports towards the rest of world?
  - Has increased cost of importing from EU reduced exports to all destinations through supply chain linkages?
- How has TCA impacted UK trade in services? Is there interdependence between goods and services trade?

Import demand & export supply controls

- Firm-level import demand control (used in export regressions)
  - Log weighted average of imports (excluding from UK) by country-HS6 product. Import data: UN Comtrade
  - Weight import value indices using firm-region export weights from first year firm enters sample
  - Controls for import demand growth in country-product varieties that firm exports
- Region-level import demand control (used in diff-in-diff export regressions)
  - Log total regional imports from world excluding UK
  - Controls for general demand growth in region
- Analogous firm-level and region-level export supply controls used in import regressions
- Controls aggregated to country or country-product level (rather than region-level) in disaggregated regressions

Other controls

- Firm-level real exchange rate
  - Log weighted average of partner-country real exchange rates. Real exchange rates data: IMF IFS
  - Weight exchange rate indices using firm-region trade weights from first year firm enters sample. Weights based on firms' exports for export regressions, imports for import regressions
  - Include contemporaneous value and 8 lags
- Region-level real exchange rate: weight partner-country real exchange rate indices by UK trade weights instead of firm-level trade weights
- UK Global Tariff (used in import regressions only)
  - Reduction in UK MFN tariff at start of 2021 by CN8-digit product, aggregated using firm-non-EU import weights and interacted with $TCA_t * (1 - EU_r)$
  - Analogous variable calculated using CN8-product-level dummy for any reduction in non-advalorem tariffs in UK Global Tariff

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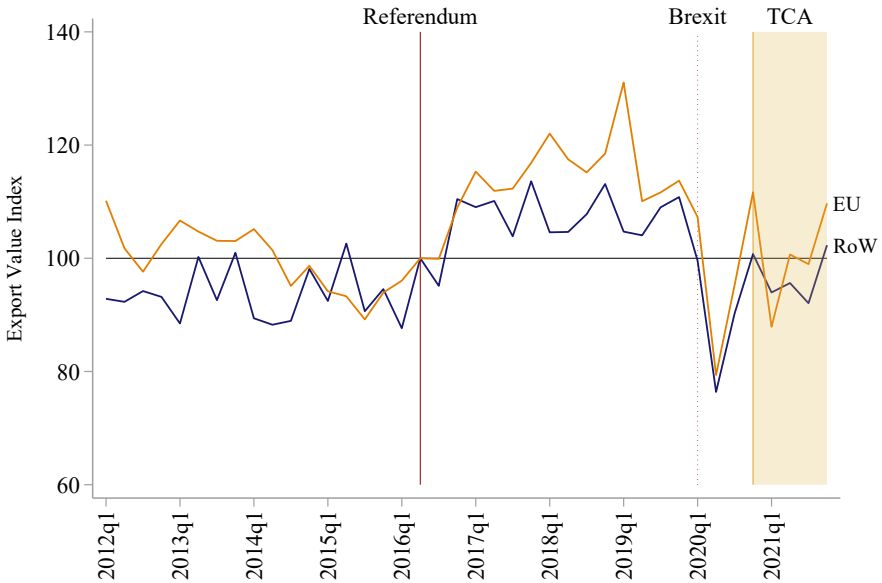
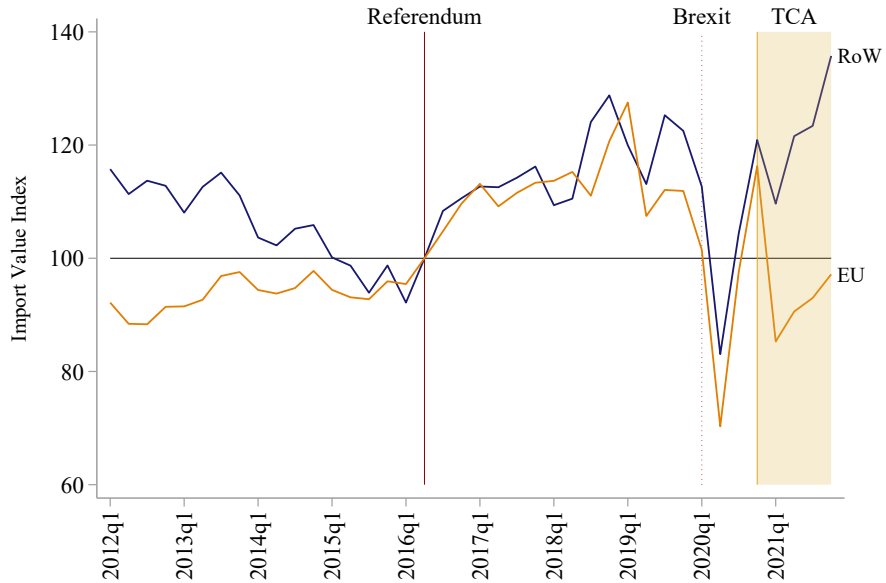
Aggregate trade in our sample



Exports



Imports

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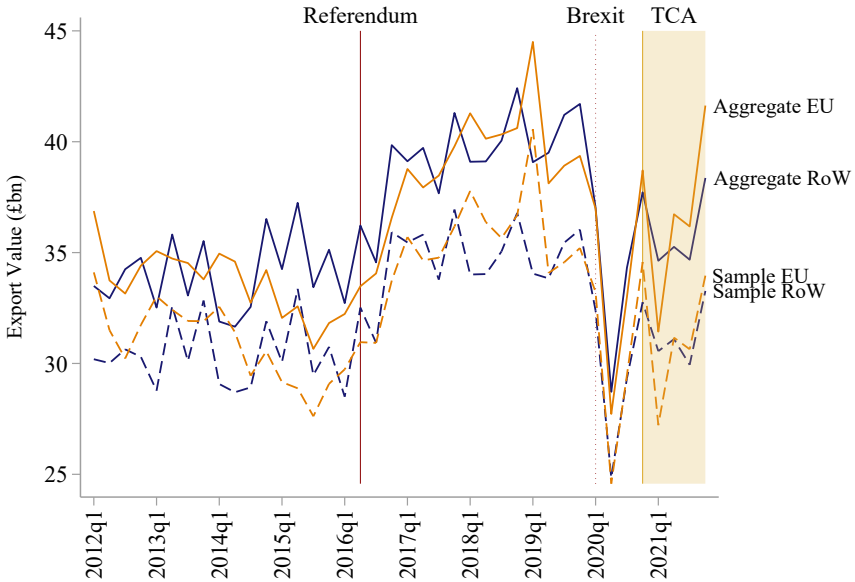
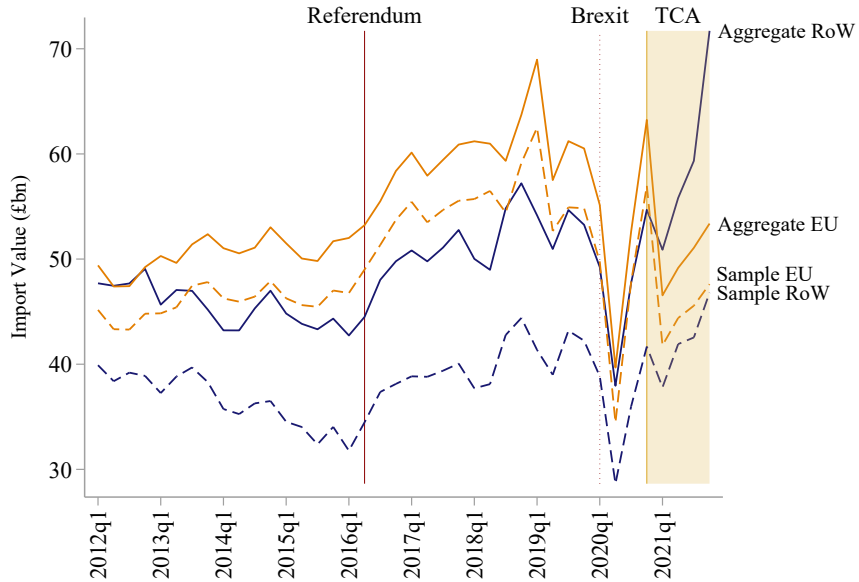
Aggregate trade: OTS vs our sample



Exports



Imports

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TCA effect by employment percentiles

	Exports		Imports	
Percentile	Employment	Effect Size	Employment	Effect Size
10	6	-24%	11	-30%
25	14	-19%	27	-29%
50	38	-13%	79	-27%
75	106	-5.8%	265	-26%
90	341	2.8%	925	-25%

Notes. Estimated effect of TCA on firm-level exports and imports with EU relative to rest of world by percentiles of the firm-level employment distributions for exporters and importers.

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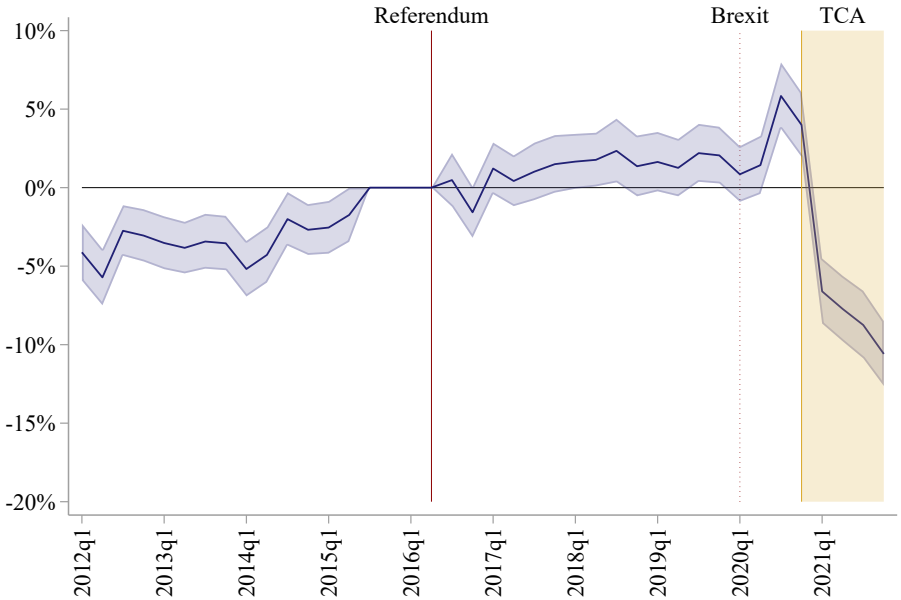
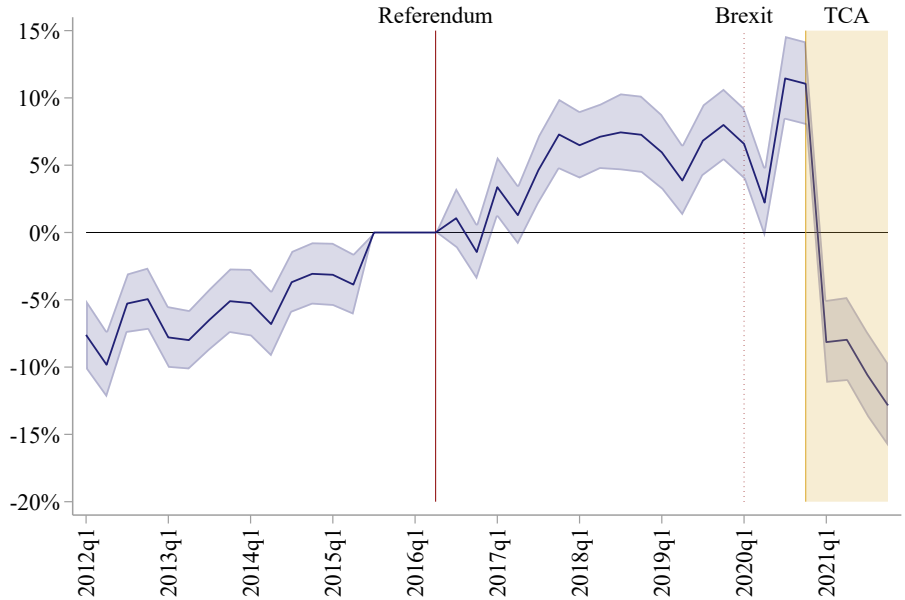
Extensive margin of firm imports: event studies



Countries



Country-products

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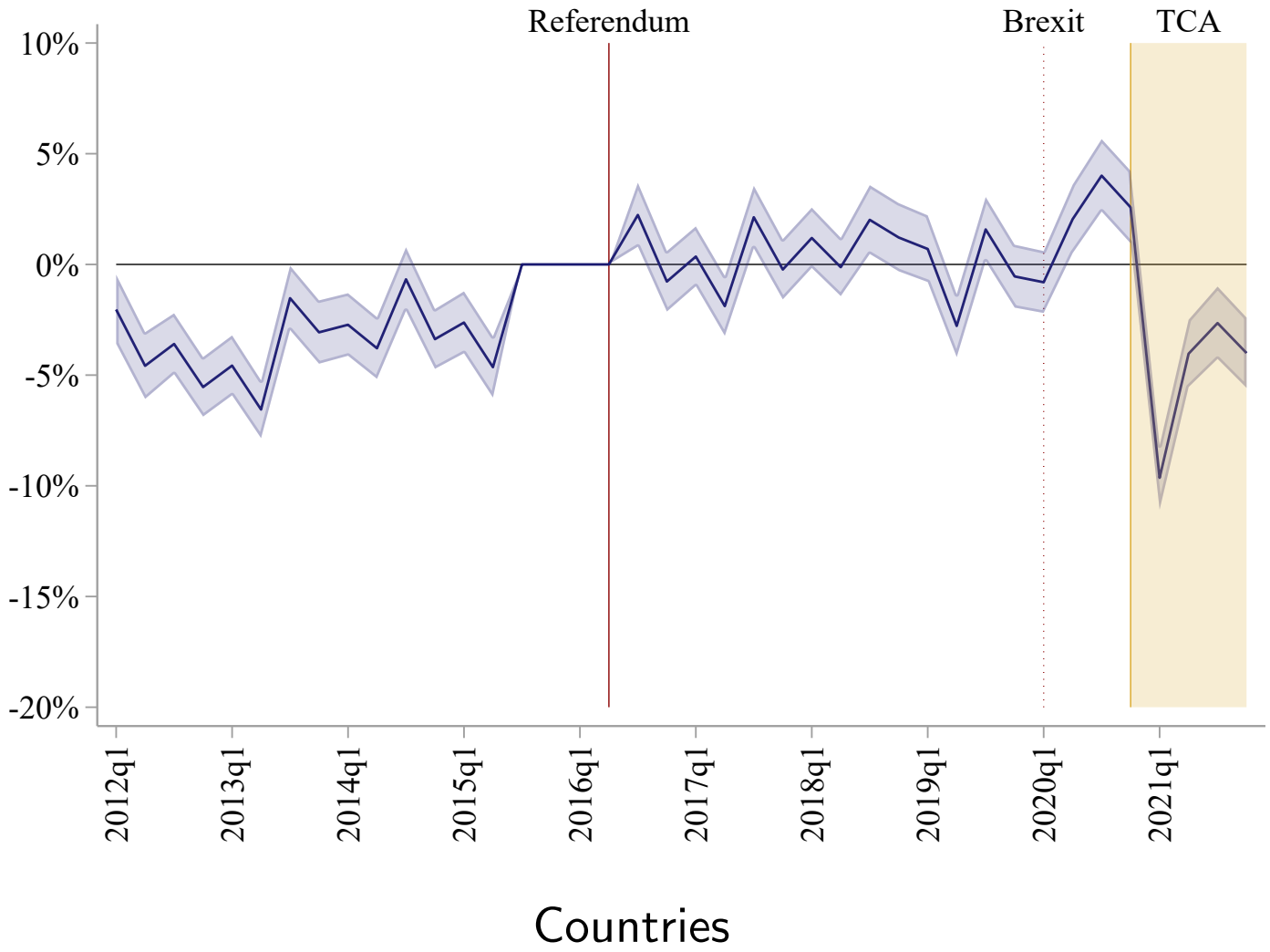
Extensive margin of firm exports: event studies



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