

Shooting down trade: Firm-level effects of embargoes

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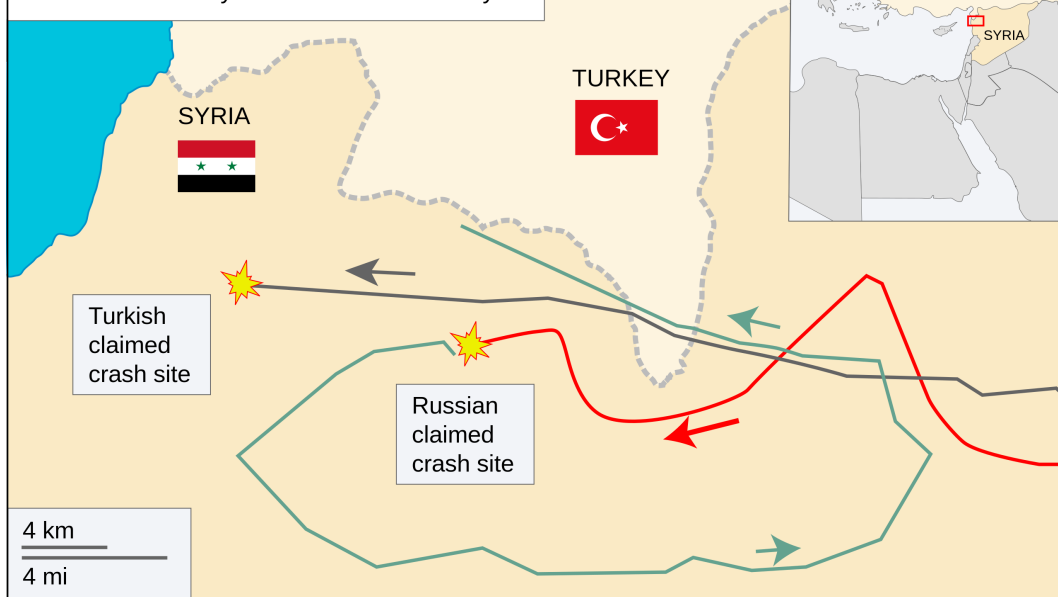
² Bielefeld University and Kiel Institute for the World Economy

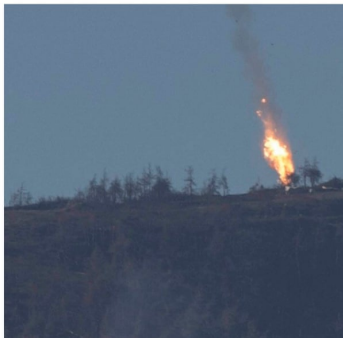
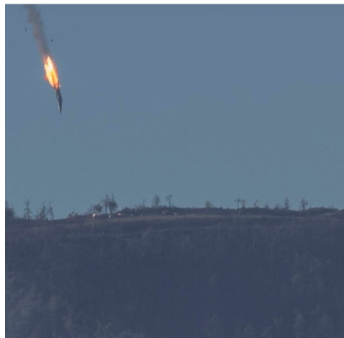
³ Paris School of Economics, Sorbonne Economics Center and IZA



Approximate flight paths according to:

— Turkish military — Russian military







Aftermath

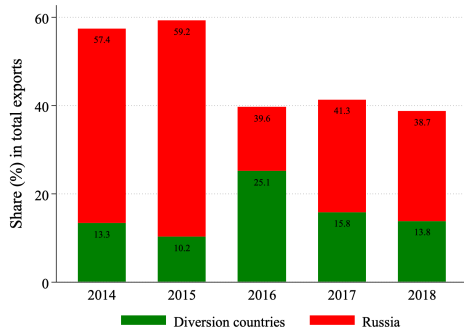
- Putin: “The loss today is a stab in the back, carried out by the accomplices of terrorists. I can’t describe it in any other way.”
- Lavrov cancels planned visit to Turkey
- Russia imposes range of measures, including very specific product-level import embargo as of Jan 1, 2016
- The embargo lasts 22 months, ending only when Turkish President Erdoğan apologized to Russian President Putin

HS Code	Product Name	Lifting Date
080510	Fresh and dried oranges	October 2016
080520	Fresh and dried mandarins	
080910	Fresh apricots	
080930	Fresh peaches including nectarines	
080940	Fresh plums and blackthorn	
060312	Clove	March 2017
070310	Onion and shallots	
070410	Broccoli	
250100	Salt	
020714	Chicken	June 2017
020727	Turkey	
070700	Cucumber and gherkin	
080810	Apples	
080830	Pears	
080610	Grapes	
081010	Strawberries	
070200	Tomato	November 1, 2017

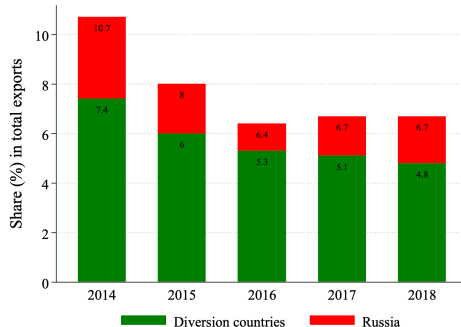
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Exports to Russia

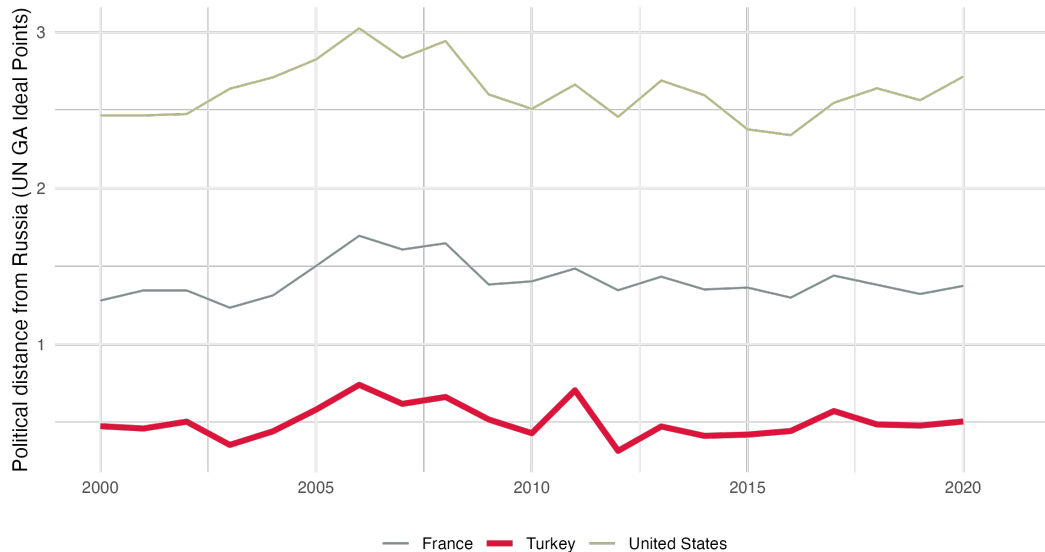
(a) Sanctioned products



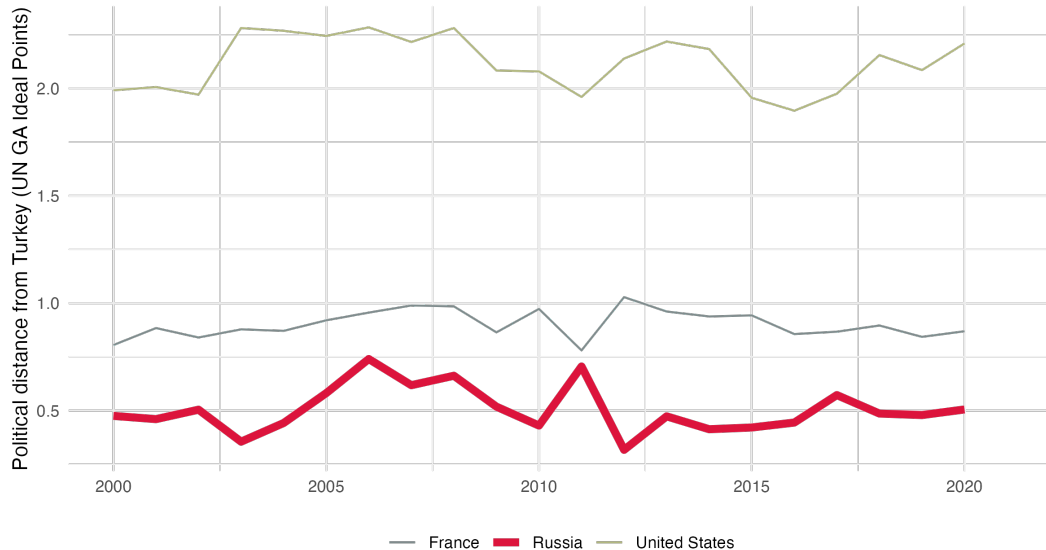
(b) Non-sanctioned products



Political relations between Russia and Turkey



Political relations between Russia and Turkey



What we do

- Setting: Sanctions in a quasi-natural experiment
 - Sudden, well-defined and strong treatment
- Question: Do sanctions actually matter for the affected firms?
- Firm-level trade effects: Old story, novel estimation
 - combination of firm- and country-level data
- Estimate other firm-level economic outcomes
 - total sales, employment, ...

What we find

- Sanctions matter, but: mostly in the short/medium run
 - Embargo effective as long as it is imposed
 - Diversion effect as long as embargo is imposed
 - Some other firm-level outcomes more persistent
- Econometrics take-away: Firm-level destination fixed effects matter!

Related literature

Related works

Macro-level effects

- Global trade effects (e.g., Hufbauer et al., 2006; Felbermayr et al., 2020)
- Coalitions (Chowdhry et al., 2023), productivity (Etkes et al., 2015), inequality (Afesorgbor & Mahadevan, 2016; Lee, 2018), growth (Kwon, 2024),

Micro-level effects

- Firms: intensive margin (e.g., Crozet & Hinz, 2020; Fransen et al., 2023; Görg et al. 2023), extensive margin (Crozet et al., 2022)
- Prices (Monastyrenko & Hinz, 2022), Health outcomes (Kirilakha, 2024; Gutmann et al., 2021), ...

Trade impact

Gravity setup

Gravity combined for firm-level (i) and country-level (o)

$$X_{\{i,o\}dkt} = \exp(\Gamma_{\{i,o\}kt} + \Gamma_{dkt} + \Gamma_{\{i,o\}dk} + \delta_k S_{odkt})$$

- Fixed effects
 - $\Gamma_{\{i,o\}kt}$: Origin \times product \times time
 - Γ_{dkt} : Destination \times product \times time
 - $\Gamma_{\{i,o\}dk}$: Origin \times destination \times product \times month
- Estimation with PPML

Combining firm-level and country-level data

Gravity combined for firm-level (i) and country-level (o)

$$X_{\{i,o\}dkt} = \exp \left(\Gamma_{\{i,o\}kt} + \Gamma_{dkt} + \Gamma_{\{i,o\}dk} + \delta_k S_{odkt} \right)$$

- Only one origin country: Γ_{dkt} and $\delta_k S_{odkt}$ are collinear
→ needed: more origin countries
- Solution: Firm-level data from Turkey + global country-level data without Turkey
→ many origin countries, $\delta_k S_{odkt}$ can be estimated

Empirical setup

- Imposition period, lifting period (varying by embargoed product)
 - 17 products, different times of lifting
- Embargo, diversion, circumvention effects
- Intensive (and extensive margin) estimations

- “Dış Ticaret İstatistikleri” from TurkStat for firm-level customs data
- Data since 2002 on firm, product, and destination at 6-digit HS level
- Subset: 2012 – 2020, embargoed products chapters 2, 6, 7, 8, and 25
- UN COMTRADE for global trade data at product level

	Three-way FE with global data	Three-way FE	Two-way FE with est. FE	Two-way FE
Embargo \times imposition period	-13.32*** (0.7000)			
Embargo \times lifting period	0.0207 (0.2240)			
Diversion \times imposition period	0.6730*** (0.1914)			
Diversion \times lifting period	0.2460 (0.1663)			
Circumvention \times imposition period	-0.4136* (0.2217)			
Circumvention \times lifting period	-0.1635 (0.2356)			
Russia-EU embargo \times imposition period	-4.6770*** (0.2642)			
Est. destination \times product \times time FE				
Observations	13,001,185			
Origin \times product \times time FE	yes			
Destination \times product \times time FE	yes			
Origin \times destination \times product \times month FE	yes			
Destination \times time FE	no			

	Three-way FE with global data	Three-way FE	Two-way FE with est. FE	Two-way FE
Embargo \times imposition period	-13.32*** (0.7000)	-13.62*** (1.0807)		
Embargo \times lifting period	0.0207 (0.2240)	-0.1518 (0.2411)		
Diversion \times imposition period	0.6730*** (0.1914)	0.0607 (0.1672)		
Diversion \times lifting period	0.2460 (0.1663)	-0.0977 (0.1786)		
Circumvention \times imposition period	-0.4136* (0.2217)	0.0813 (0.2107)		
Circumvention \times lifting period	-0.1635 (0.2356)	0.5076** (0.2111)		
Russia-EU embargo \times imposition period	-4.6770*** (0.2642)			
Est. destination \times product \times time FE				
Observations	13,001,185	1,179,861		
Origin \times product \times time FE	yes	yes		
Destination \times product \times time FE	yes	no		
Origin \times destination \times product \times month FE	yes	yes		
Destination \times time FE	no	yes		

	Three-way FE with global data	Three-way FE	Two-way FE with est. FE	Two-way FE
Embargo \times imposition period	-13.32*** (0.7000)	-13.62*** (1.0807)	-12.93*** (0.7310)	
Embargo \times lifting period	0.0207 (0.2240)	-0.1518 (0.2411)	-0.1752 (0.1484)	
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Est. destination \times product \times time FE			0.8567*** (0.0472)	
Observations	13,001,185	1,179,861	1,114,179	
Origin \times product \times time FE	yes	yes	yes	
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Origin \times destination \times product \times month FE	yes	yes	yes	
Destination \times time FE	no	yes	yes	

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Embargo \times imposition period	-13.32*** (0.7000)	-13.62*** (1.0807)	-12.93*** (0.7310)	-14.36*** (0.6742)
Embargo \times lifting period	0.0207 (0.2240)	-0.1518 (0.2411)	-0.1752 (0.1484)	-0.7000*** (0.2061)
Diversion \times imposition period	0.6730*** (0.1914)	0.0607 (0.1672)	0.1730 (0.1191)	0.0831 (0.1308)
Diversion \times lifting period	0.2460 (0.1663)	-0.0977 (0.1786)	-0.0488 (0.1088)	-0.2351* (0.1346)
Circumvention \times imposition period	-0.4136* (0.2217)	0.0813 (0.2107)	-0.4077*** (0.1399)	-0.4436*** (0.1429)
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Russia-EU embargo \times imposition period	-4.6770*** (0.2642)			
Est. destination \times product \times time FE			0.8567*** (0.0472)	
Observations	13,001,185	1,179,861	1,114,179	1,185,212
Origin \times product \times time FE	yes	yes	yes	yes
Destination \times product \times time FE	yes	no	no	no
Origin \times destination \times product \times month FE	yes	yes	yes	yes
Destination \times time FE	no	yes	yes	no

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Embargo × imposition period	-13.32*** (0.7000)	-13.62*** (1.0807)	-12.93*** (0.7310)	-14.36*** (0.6742)
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Origin × product × time FE	yes	yes	yes	yes
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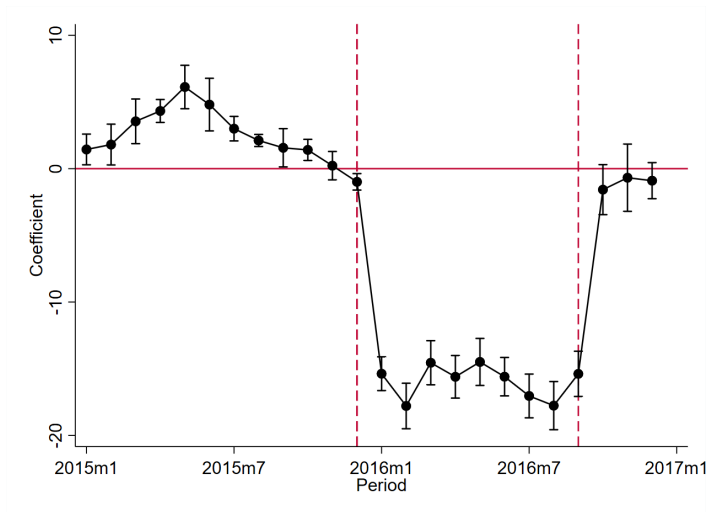
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Event study: Oranges, apricots, etc. (Embargo lifted in October 2016)



Additional results

- Larger firms (total exports or number of products)
 - diverted more
 - “circumvented” less
- But: Size played no role in “return to normal”

Impact beyond trade

Impact beyond trade

- Do embargoes really matter economically?
 - short-term and long-run
- Firm-level indicators for activity: Domestic sales and purchases, employment
- This part is work-in-progress..

Non-trade firm-level data

- “Beyan Alış-Beyan Satış verileri” for domestic input-output linkages from Ministry of Treasury and Finance
 - firm-level transactions over 5,000 TL (\approx 160 USD in 2012)
- Firm registry for industry and location, using NACE classification to identify embargo-related activities and domestic sales by suppliers.
- Employer-employee dataset from the Social Security Institute
 - employment, wages, and workdays data

Empirical setup

Classic difference-in-differences setup

$$\log X_{it} = \Gamma_{im} + \Gamma_t + \delta^{Imposition} \cdot S_{it} + \delta^{Lifting} \cdot L_{it} + \epsilon_{it}$$

- Firm \times month and time fixed effect
- Treatment: Firm exported embargoed products to Russia before imposition
→ Treatment period: Imposition and lifting period
- Control group:
 - Firms exported embargoed products to other markets and
 - Firms exporting non-embargoed products to Russia

Domestic sales and number of customers

Model:	(1) log Value Sales	(2) log Number Customers
<i>Variables</i>		
Embargo \times period imposition	-0.0367 (0.0499)	-0.1135** (0.0514)
Embargo \times period lifting	-0.0002 (0.0652)	-0.1831** (0.0851)
<i>Fixed-effects</i>		
Firm \times month	Yes	Yes
Time	Yes	Yes
Observations	302,409	302,409

Domestic purchases and number of suppliers

Model:	(1) log Value Purchases	(2) log Number Suppliers
<i>Variables</i>		
Embargo \times period imposition	-0.2176*** (0.0481)	-0.1236*** (0.0374)
Embargo \times period lifting	-0.1845*** (0.0706)	-0.1232*** (0.0470)
<i>Fixed-effects</i>		
Firm \times month	Yes	Yes
Time	Yes	Yes
Observations	303,134	303,134

Domestic purchases and number of suppliers (Agricultural goods and salt)

Model:	(1)	(2)
	log Value	log Number
	Agri/Salt Purchases	Agri/Salt Suppliers
<i>Variables</i>		
Embargo \times period imposition	-0.2267** (0.1128)	-0.1255** (0.0634)
Embargo \times period lifting	-0.1615 (0.1206)	-0.1428* (0.0820)
<i>Fixed-effects</i>		
Firm \times month	Yes	Yes
Time	Yes	Yes
Observations	55,169	55,169

Employment and wage

Model:	(1)	(2)	(3)	(4)
	Exporters		Suppliers	
	Number of employees	Ave. daily wage	Number of employees	Ave. daily wage
<i>Variables</i>				
Embargo	-0.1108***	0.0102	0.0079	-0.0296*
× period imposition	(0.0411)	(0.0221)	(0.0457)	(0.0162)
Embargo	-0.1993***	-0.0141	0.0507	0.0283
× period lifting	(0.0760)	(0.0239)	(0.0534)	(0.0198)
<i>Fixed-effects</i>				
Firm × quarter	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes
Observations	99,492	99,492	40,386	40,386

Firm-level effects beyond trade

- No trade diversion towards domestic market (even fewer customers)
- Overall purchases and number of suppliers shrinks
 - But: not for actually exported goods
- Firms appear to downsize: Lower number of workers
 - Permanently!
- Work-in-progress: Heterogeneous treatment, heterogeneous effects (e.g. by size)

Conclusion

Conclusion

- Do embargoes really matter economically?
 - Trade effects temporary
 - Firms downsize: Employment stays reduced permanently
 - Domestic network shrinks permanently while value constant
- Firms permanently affected
- Econometric take-away: Combine firm- & country-level data for proper fixed effects

Shooting down trade: Firm-level effects of embargoes

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Bluesky: [@julianhi.nz](https://bsky.app/profile/julianhi.nz)

Additional measures

- Various measures prohibiting Turkish companies to carry out activities in Russia
- No new employment of new Turkish workers
- Suspension of visa-free travel between two countries
- Banning of charter flights to Turkey

Summary statistics of firms in 2015: Exports

Panel A: Sanctioned product exporters			
	Russia	Diversion	All
Number of firms	407	619	1,589
Number of products exported	7	5	4
Number of destinations served	4	3	2
Total export	957,108	462,527	172,509
Panel B: All exporters			
	Russia	Diversion	All
Number of firms	629	1,553	5,613
Number of products exported	4	2	1
Number of destinations served	4	2	1
Total export	858,195	77,704	43,140

Summary statistics of firms in 2015: Non-trade outcomes

	Treated	Control
Number of employees	13	15
Average wage (in TL)	43.30	46.13
Domestic sales (in TL)	6,441,105	4,385,632
Number of domestic customers	2	2
Domestic purchases (in TL)	4,992,482	3,662,604
Number of domestic suppliers	8	5
Domestic agri. purchases (in TL)	358,037	123,140
Number of domestic agri. suppliers	8	5
Domestic sales of agri. producers (in TL)	616,480	878,510
Number of domestic suppliers of agri. producers	1	2