Shooting down trade: Firm-level effects of embargoes

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ВВС РОССИИ
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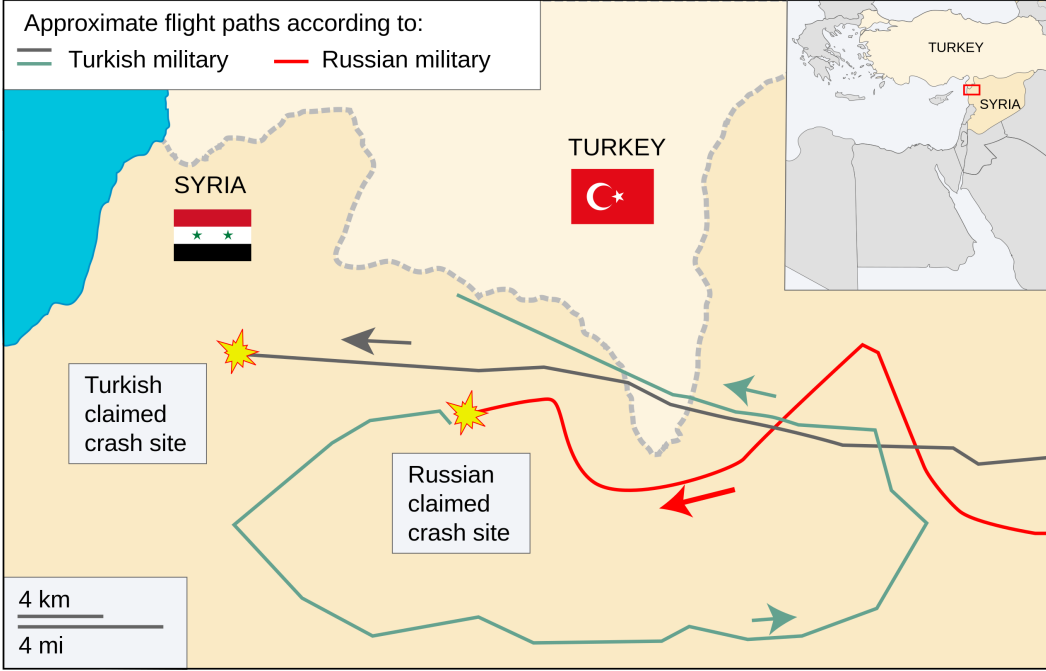
Approximate flight paths according to:
Turkish military
Russian military
SYRIA
TURKEY
TURKEY
SYRIA
Turkish claimed crash site
Russian claimed crash site
4 km
4 mi





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

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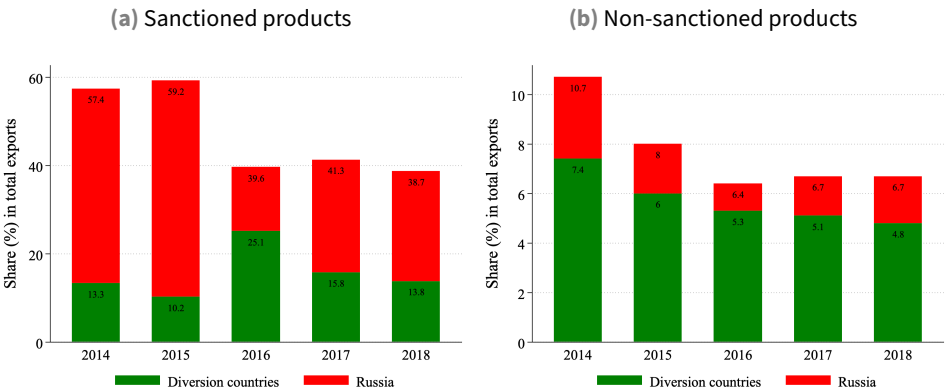
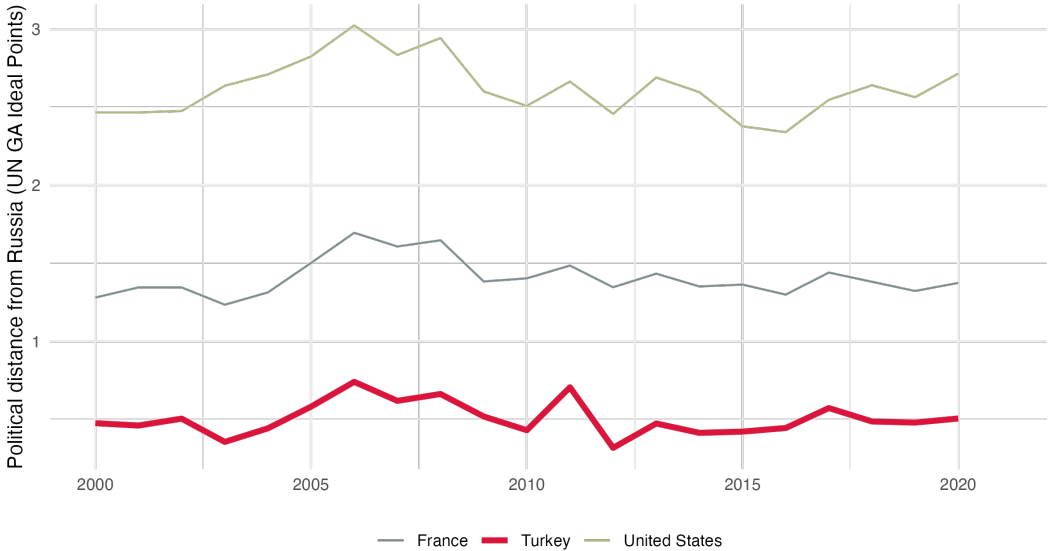
Exports to Russia



Political relations between Russia and Turkey



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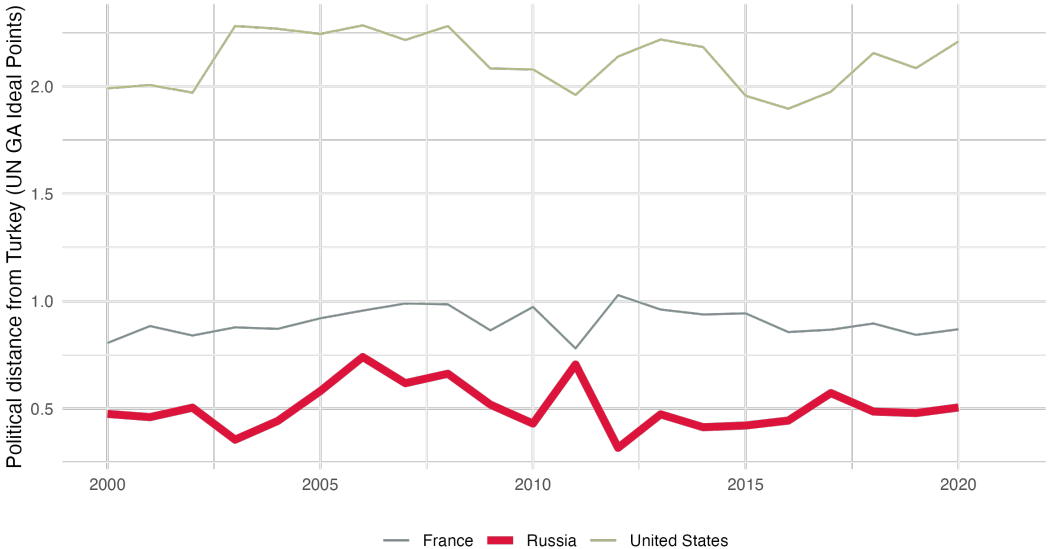

What we do

- 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)

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

- Fixed effects
  - $\rightarrow$ $\Gamma_{\{i,o\}kt}$: Origin $\times$ product $\times$ time
  - $\rightarrow$ Γ_{dkt}: Destination $\times$ product $\times$ time
  - $\rightarrow$ $\Gamma_{\{i,o\}dk}$: 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

  $\rightarrow$ needed: more origin countries

- Solution: Firm-level data from Turkey + global country-level data without Turkey

  $\rightarrow$ 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

Trade data

- “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 × imposition period	-13.32***			
	(0.7000)			
Embargo × lifting period	0.0207			
	(0.2240)			
Diversion × imposition period	0.6730***			
	(0.1914)			
Diversion × lifting period	0.2460			
	(0.1663)			
Circumvention × imposition period	-0.4136*			
	(0.2217)			
Circumvention × lifting period	-0.1635			
	(0.2356)			
Russia-EU embargo × imposition period	-4.6770***			
	(0.2642)			
Est. destination × product × time FE				
Observations	13,001,185			
Origin × product × time FE	yes			
Destination × product × time FE	yes			
Origin × destination × product × month FE	yes			
Destination × time FE	no			

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

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Embargo × imposition period	-13.32***	-13.62***	-12.93***	
	(0.7000)	(1.0807)	(0.7310)	
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	(0.2240)	(0.2411)	(0.1484)	
Diversion × imposition period	0.6730***	0.0607	0.1730	
	(0.1914)	(0.1672)	(0.1191)	
Diversion × lifting period	0.2460	-0.0977	-0.0488	
	(0.1663)	(0.1786)	(0.1088)	
Circumvention × imposition period	-0.4136*	0.0813	-0.4077***	
	(0.2217)	(0.2107)	(0.1399)	
Circumvention × lifting period	-0.1635	0.5076**	-0.1058	
	(0.2356)	(0.2111)	(0.1328)	
Russia-EU embargo × imposition period	-4.6770***			
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Observations	13,001,185	1,179,861	1,114,179	
Origin × product × time FE	yes	yes	yes	
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Diversion × lifting period	0.2460	-0.0977	-0.0488	-0.2351*
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Circumvention × imposition period	-0.4136*	0.0813	-0.4077***	-0.4436***
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Origin × product × time FE	yes	yes	yes	yes
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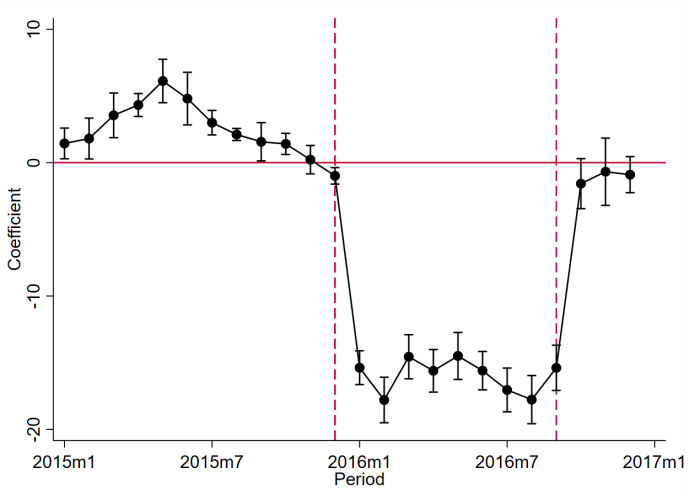
Event study: Oranges, apricots, etc. (Embargo lifted in October 2016)



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
  - $\rightarrow$ 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
  - $\rightarrow$ 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

  $\rightarrow$ 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
Variables		
Embargo × period imposition	-0.0367	-0.1135**
	(0.0499)	(0.0514)
Embargo × period lifting	-0.0002	-0.1831**
	(0.0652)	(0.0851)
Fixed-effects		
Firm × 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
Variables		
Embargo × period imposition	-0.2176***	-0.1236***
	(0.0481)	(0.0374)
Embargo × period lifting	-0.1845***	-0.1232***
	(0.0706)	(0.0470)
Fixed-effects		
Firm × month	Yes	Yes
Time	Yes	Yes
Observations	303,134	303,134

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

Model:	(1) log Value Agri/Salt Purchases	(2) log Number Agri/Salt Suppliers
Variables		
Embargo × period imposition	-0.2267**	-0.1255**
	(0.1128)	(0.0634)
Embargo × period lifting	-0.1615	-0.1428*
	(0.1206)	(0.0820)
Fixed-effects		
Firm × 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
Variables				
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)
Fixed-effects				
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

  $\rightarrow$ 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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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