How does violent conflict affect third-country trade? Evidence from a big data analysis in a triadic country setting.

Helge Zille

UNU-WIDER

Nordic Conference on Development Economics

June 12th 2018

Literature

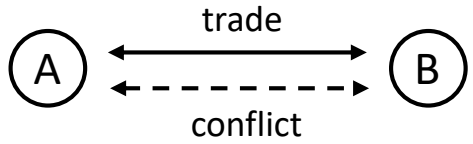
- Long tradition in political sciences (International Political Economy)
- Focus on the effect of trade on peace and conflict
- On the effect of conflict on trade
  - Much more scarce
  - Important studies: Li & Sacko (2002), Long (2008), Keshk et al. (2010)
  - Conflict reduces trade

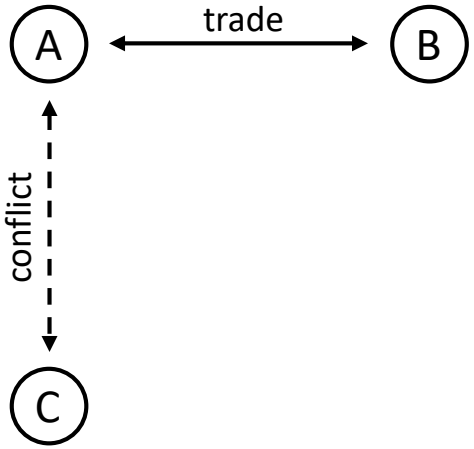
Effect on third countries

  - No systematic research
  - Trade shifting to secondary neighbors (De Groot 2010)
  - Trade shifting as a way of sanction busting (Caruso 2003)

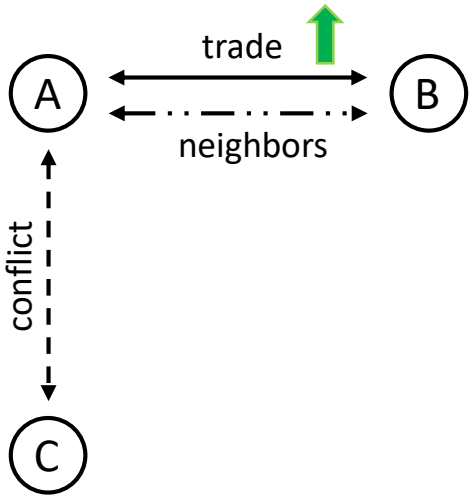
Theory

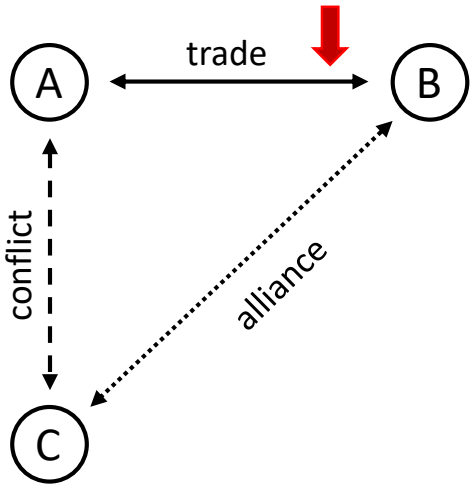
- Practical consequences of conflict
  - Destruction
  - Reallocation of capital
  - Costs and risks
- Active decisions
  - Sanctions, boycotts
- Third-country trade
  - Trade shifting
  - Spillovers
  - Active decisions

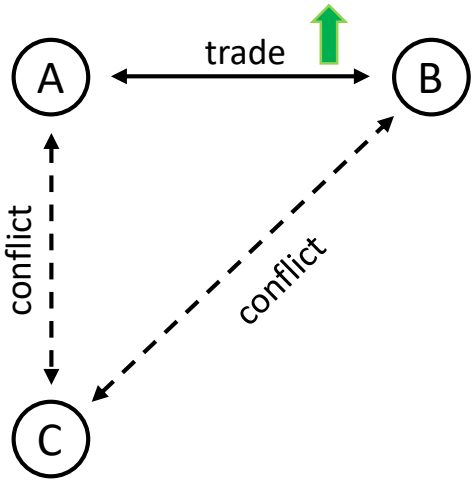


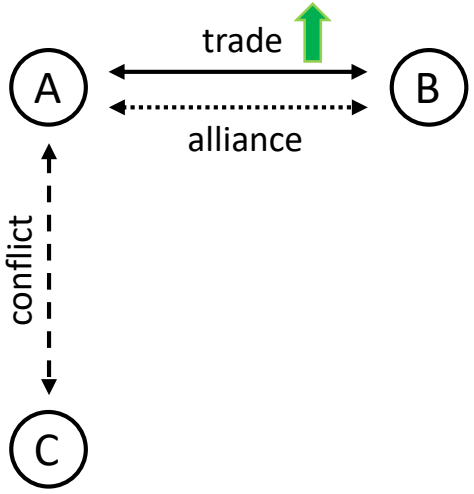


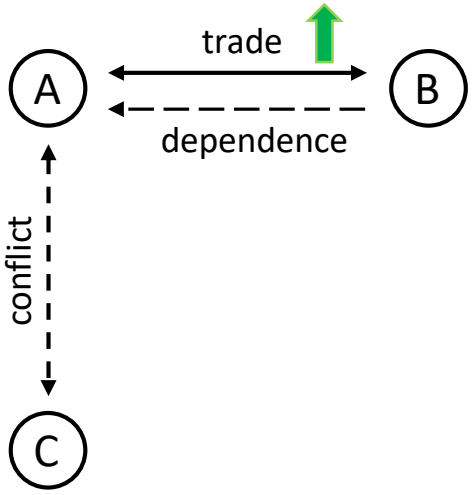
Relationship Constellations

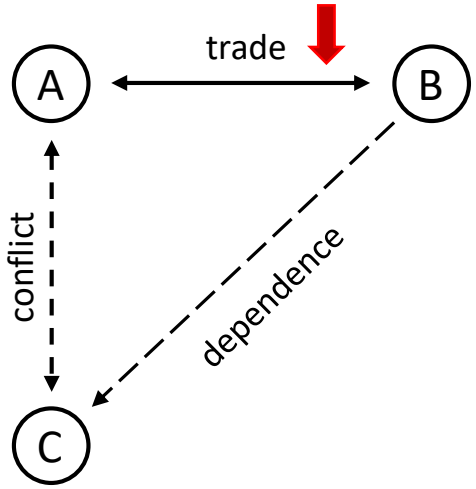




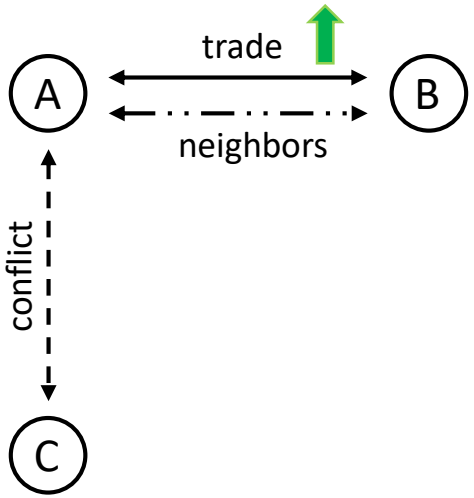




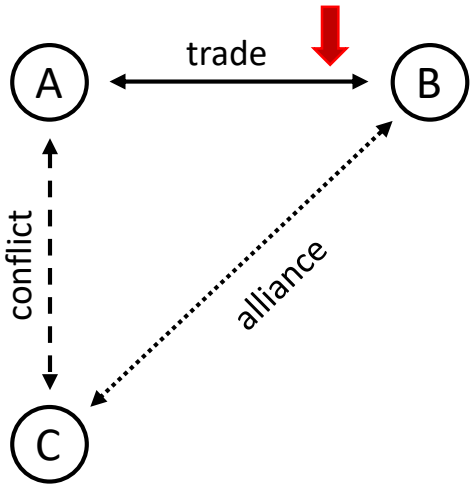




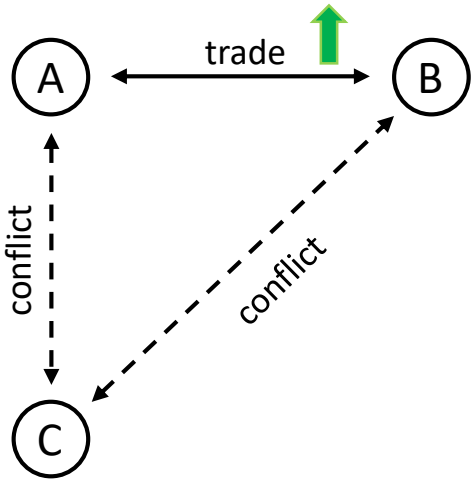
Relationship Constellations



- Geographic distance as a strong predictor of trade
- Costs of creating foreign contacts
- Costs of interaction with contacts



- Trade as a non-military measure to support allies



- Trade as a non-military measure to support allies
- Mutual support
- Harming the common enemy

Data I

- International Crisis Behavior Project (ICB)
  - Interstate conflicts on a dyadic level from 1918 to 2013
- Correlates of War (COW)
  - Imports and exports on a dyadic level from 1870 to 2014
  - Contiguity and formal security alliances
- Maddison Project
  - GDP data from 1820 to 2008
- World Development Indicators (WDI)
  - GDP data from 1960 to 2017

Data II

- Country **triads** instead of country **dyads**
- 201 countries
  - 40,200 dyads
  - 7,999,800 triads
- 96 years
  - 767,980,800 triad-year observations (potentially!)
- Missing data
  - About 100 million triad-year observations

Estimation Strategy I

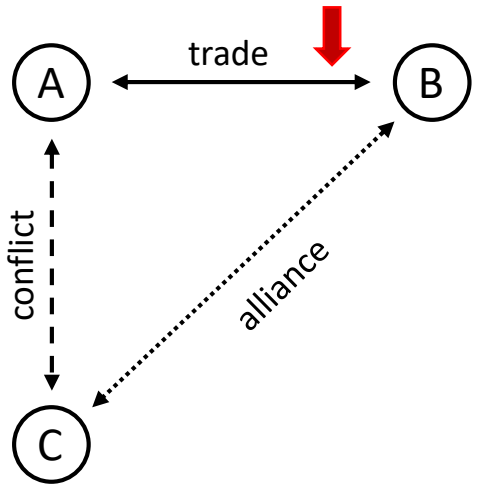
$$y_{it} = B_x X_{it-1} + \eta_i + \varepsilon_{it}$$

- y_{it} dyadic trade in year t
- B_x vector of coefficients
- X_{it-1} vector of time-variant regressors (conflict, GDP, previous trade, relationship variables)
- η_i latent time-invariant variables
- ε_{it} triad-specific error term (iid)

Estimation Strategy II

$$ln(\text{dtrade}_{abt}) = \beta_0 + \beta_1\, ln(\text{dtrade}_{abt-1}) + \beta_2\, ln(\text{GDP}_{at-1}) + \beta_3 ln(\text{GDP}_{bt-1}) + \beta_4 ln(\text{GDP}_{ct-1}) + \beta_5 \text{MID}_{abt-1} + \beta_6 \text{MID}_{act-1} + \beta_7 \text{MID}_{bct-1} + \beta_8 \text{rel}_{abt-1} + \beta_9 \text{rel}_{act-1} + \beta_{10} \text{rel}_{bct-1} + \beta_{11} (\text{MID}_{act-1} * \text{rel}_{ht-1}) + \varepsilon_{abct}$$

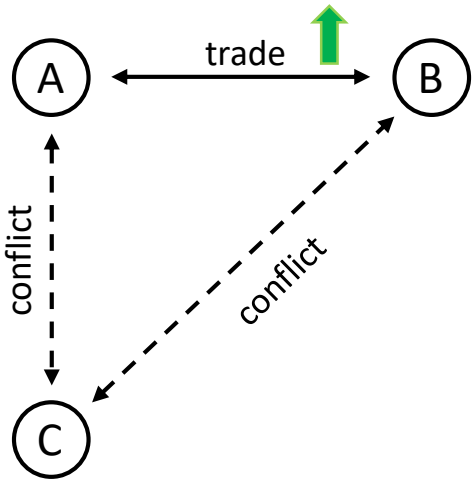
- dtrade_{abt} sum of imports and exports between A and B in t
- dtrade_{abt-1} sum of imports and exports between A and B in t-1
- GDP_{it-1} GDP of countries A, B, and C in t-1
- MID_{ijt-1} violent conflict between the different country pairs in t-1
- rel_{ijt-1} relationship variable between the different country pairs in t-1
- $\text{MID}_{act-1} * \text{rel}_{ht-1}$ interaction term for conditional effect



Conflict, trade, and alliances

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.542***	0.601***	0.525***	0.530***
	(0.000447)	(0.000499)	(0.000541)	(0.000600)
log GDP C	0.0171***	0.0583***	0.000112	2.95e-05
	(0.000390)	(0.000441)	(0.000449)	(0.000503)
MID AB	-0.861***	-0.870***	-0.817***	-0.860***
	(0.00417)	(0.00575)	(0.00416)	(0.00573)
MID AC	-0.132***	-0.116***	-0.116***	-0.0985***
	(0.00481)	(0.00648)	(0.00478)	(0.00646)
MID BC	-0.138***	-0.124***	-0.123***	-0.108***
	(0.00459)	(0.00618)	(0.00457)	(0.00616)
alliance AB	0.134***	0.139***	0.119***	0.139***
	(0.00109)	(0.00135)	(0.00109)	(0.00135)
alliance AC, BC	-0.0104***	0.00988***	-0.0257***	0.0151***
	(0.00122)	(0.00153)	(0.00123)	(0.00153)
MID AC * alliance BC	-0.0747***	-0.0855***	-0.0800***	-0.113***
	(0.0161)	(0.0212)	(0.0160)	(0.0212)
log trade AB	0.558***	0.490***	0.554***	0.487***
	(9.01e-05)	(8.69e-05)	(9.05e-05)	(8.71e-05)
Constant	-10.95***	-12.55***	-9.261***	-10.79***
	(0.00348)	(0.00414)	(0.0913)	(0.00964)
Full effect of violent conflict AC	-19.56%	-19.15%	-18.64%	-20.07%
Observations	84,187,954	101,005,598	84,187,954	101,005,598
Maddison sample	YES	-	YES	-
WDI sample	-	YES	-	YES
Year dummies	-	-	YES	YES

Standard errors in parentheses
*** p<0.001, ** p<0.005, * p<0.01

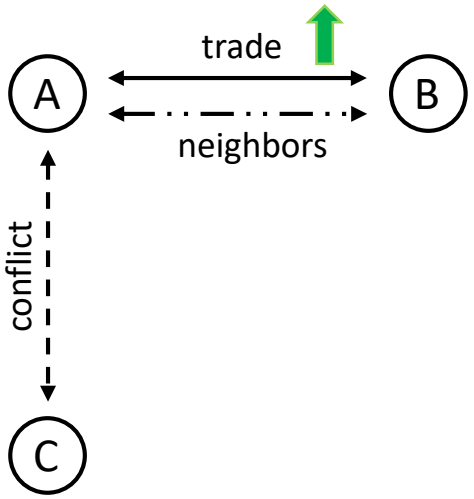


Multiple conflicts and trade

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.542***	0.601***	0.524***	0.527***
	(0.000447)	(0.000498)	(0.000541)	(0.000599)
log GDP C	0.0185***	0.0604***	0.000201	-5.61e-05
	(0.000390)	(0.000440)	(0.000449)	(0.000503)
MID AB	-0.863***	-0.874***	-0.818***	-0.865***
	(0.00417)	(0.00574)	(0.00416)	(0.00572)
MID AC	-0.158***	-0.134***	-0.140***	-0.118***
	(0.00471)	(0.00630)	(0.00469)	(0.00628)
MID BC	-0.158***	-0.134***	-0.140***	-0.118***
	(0.00471)	(0.00630)	(0.00469)	(0.00628)
MID AC * MID BC	0.390***	0.256***	0.342***	0.235***
	(0.0208)	(0.0317)	(0.0207)	(0.0315)
log trade AB	0.559***	0.490***	0.554***	0.487***
	(9.01e-05)	(8.69e-05)	(9.05e-05)	(8.71e-05)
Constant	-10.96***	-12.57***	-9.243***	-10.73***
	(0.00346)	(0.00413)	(0.0914)	(0.00963)
Full effect of violent conflict AC	33.08%	16.63%	27.71%	15.36%
Observations	84,187,954	101,005,598	84,187,954	101,005,598
Maddison sample	YES	-	YES	-
WDI sample	-	YES	-	YES
Year dummies	-	-	YES	YES

Standard errors in parentheses

*** p<0.001, ** p<0.005, * p<0.01



Conflict, trade, and contiguity

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.542***	0.601***	0.524***	0.527***
	(0.000447)	(0.000498)	(0.000542)	(0.000599)
log GDP C	0.0187***	0.0604***	0.000277	-1.48e-05
	(0.000390)	(0.000440)	(0.000449)	(0.000503)
MID AB	-0.864***	-0.874***	-0.820***	-0.865***
	(0.00417)	(0.00574)	(0.00416)	(0.00572)
MID AC	-0.147***	-0.130***	-0.132***	-0.114***
	(0.00476)	(0.00635)	(0.00473)	(0.00633)
MID BC	-0.138***	-0.125***	-0.123***	-0.110***
	(0.00459)	(0.00618)	(0.00457)	(0.00616)
contiguity AB	0.0754***	-0.154***	0.0922***	-0.159***
	(0.00569)	(0.0109)	(0.00565)	(0.0108)
contiguity AC, BC	-0.0495***	0.0465***	-0.0300***	0.0344***
	(0.00353)	(0.00603)	(0.00351)	(0.00601)
MID AC * contiguity AB	0.140***	0.0943***	0.138***	0.0861**
	(0.0181)	(0.0273)	(0.0180)	(0.0272)
log trade AB	0.559***	0.490***	0.554***	0.487***
	(9.01e-05)	(8.69e-05)	(9.05e-05)	(8.71e-05)
Constant	-10.96***	-12.57***	-9.246***	-10.73***
	(0.00347)	(0.00417)	(0.0914)	(0.00964)
Full effect of violent conflict AC	1.36%	-2.30%	2.43%	-1.78%
Observations	84,187,954	101,005,598	84,187,954	101,005,598
Maddison sample	YES	-	YES	-
WDI sample	-	YES	-	YES
Year dummies	-	-	YES	YES

Standard errors in parentheses
*** p<0.001, ** p<0.005, * p<0.01

Conclusion/Outlook

- Remaining Hypotheses: Two rejections, one confirmation
- Work in progress
  - Room for improvement: Sample, controls, mechanisms…
- Main issue: Causality
  - Lagged regressors as estimation strategy?
  - Instruments? Relative military spending and military personal?
  - GMM? Computer power!

Appendix

Conflict, trade, and contiguity (Hypothesis 2)

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.542***	0.601***	0.524***	0.527***
	(0.000447)	(0.000498)	(0.000542)	(0.000599)
log GDP C	0.0187***	0.0604***	0.000277	-1.48e-05
	(0.000390)	(0.000440)	(0.000449)	(0.000503)
MID AB	-0.864***	-0.874***	-0.820***	-0.865***
	(0.00417)	(0.00574)	(0.00416)	(0.00572)
MID AC	-0.147***	-0.130***	-0.132***	-0.114***
	(0.00476)	(0.00635)	(0.00473)	(0.00633)
MID BC	-0.138***	-0.125***	-0.123***	-0.110***
	(0.00459)	(0.00618)	(0.00457)	(0.00616)
contiguity AB	0.0754***	-0.154***	0.0922***	-0.159***
	(0.00569)	(0.0109)	(0.00565)	(0.0108)
contiguity AC, BC	-0.0495***	0.0465***	-0.0300***	0.0344***
	(0.00353)	(0.00603)	(0.00351)	(0.00601)
MID AC * contiguity AB	0.140***	0.0943***	0.138***	0.0861**
	(0.0181)	(0.0273)	(0.0180)	(0.0272)
log trade AB	0.559***	0.490***	0.554***	0.487***
	(9.01e-05)	(8.69e-05)	(9.05e-05)	(8.71e-05)
Constant	-10.96***	-12.57***	-9.246***	-10.73***
	(0.00347)	(0.00417)	(0.0914)	(0.00964)
Full effect of violent conflict AC	1.36%	-2.30%	2.43%	-1.78%
Observations	84,187,954	101,005,598	84,187,954	101,005,598
Number of identifiers	3,226,028	4,819,898	3,226,028	4,819,898
R-squared within	0.6492	0.4896	0.6535	0.4937
R-squared between	0.8945	0.8830	0.8959	0.8954
R-squared overall	0.8270	0.8158	0.8295	0.8272
Maddison sample	YES	-	YES	-
WDI sample	-	YES	-	YES
Year dummies	-	-	YES	YES

Standard errors in parentheses

*** p<0.001, ** p<0.005, * p<0.01

Conflict, trade, and alliances (Hypothesis 3)

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.542***	0.601***	0.525***	0.530***
	(0.000447)	(0.000499)	(0.000541)	(0.000600)
log GDP C	0.0171***	0.0583***	0.000111	2.87e-05
	(0.000390)	(0.000441)	(0.000449)	(0.000503)
MID AB	-0.861***	-0.871***	-0.817***	-0.861***
	(0.00417)	(0.00574)	(0.00416)	(0.00572)
MID AC	-0.142***	-0.126***	-0.124***	-0.108***
	(0.00486)	(0.00652)	(0.00484)	(0.00649)
MID BC	-0.139***	-0.125***	-0.123***	-0.109***
	(0.00459)	(0.00618)	(0.00457)	(0.00616)
alliance AB	0.134***	0.139***	0.119***	0.139***
	(0.00109)	(0.00135)	(0.00109)	(0.00135)
alliance AC, BC	-0.0104***	0.00986***	-0.0257***	0.0151***
	(0.00122)	(0.00153)	(0.00123)	(0.00153)
MID AC * alliance AB	0.0385*	0.0182	0.00681	-0.00988
	(0.0146)	(0.0203)	(0.0145)	(0.0203)
log trade AB	0.558***	0.490***	0.554***	0.487***
	(9.01e-05)	(8.69e-05)	(9.05e-05)	(8.71e-05)
Constant	-10.95***	-12.55***	-9.261***	-10.79***
	(0.00348)	(0.00414)	(0.0913)	(0.00964)
Full effect of violent conflict AC	-9.32%	-10.00%	-10.98%	-11.22%
Observations	84,187,954	101,005,598	84,187,954	101,005,598
Number of identifiers	3,226,028	4,819,898	3,226,028	4,819,898
R-squared within	0.6493	0.4896	0.6535	0.4937
R-squared between	0.8953	0.8868	0.8961	0.8986
R-squared overall	0.8277	0.8201	0.8297	0.8311
Maddison sample	YES	-	YES	-
WDI sample	-	YES	-	YES
Year dummies	-	-	YES	YES

Standard errors in parentheses
*** p<0.001, ** p<0.005, * p<0.01

Conflict, trade, and alliances (Hypothesis 4)

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.542***	0.601***	0.525***	0.530***
	(0.000447)	(0.000499)	(0.000541)	(0.000600)
log GDP C	0.0171***	0.0583***	0.000112	2.95e-05
	(0.000390)	(0.000441)	(0.000449)	(0.000503)
MID AB	-0.861***	-0.870***	-0.817***	-0.860***
	(0.00417)	(0.00575)	(0.00416)	(0.00573)
MID AC	-0.132***	-0.116***	-0.116***	-0.0985***
	(0.00481)	(0.00648)	(0.00478)	(0.00646)
MID BC	-0.138***	-0.124***	-0.123***	-0.108***
	(0.00459)	(0.00618)	(0.00457)	(0.00616)
alliance AB	0.134***	0.139***	0.119***	0.139***
	(0.00109)	(0.00135)	(0.00109)	(0.00135)
alliance AC, BC	-0.0104***	0.00988***	-0.0257***	0.0151***
	(0.00122)	(0.00153)	(0.00123)	(0.00153)
MID AC * alliance BC	-0.0747***	-0.0855***	-0.0800***	-0.113***
	(0.0161)	(0.0212)	(0.0160)	(0.0212)
log trade AB	0.558***	0.490***	0.554***	0.487***
	(9.01e-05)	(8.69e-05)	(9.05e-05)	(8.71e-05)
Constant	-10.95***	-12.55***	-9.261***	-10.79***
	(0.00348)	(0.00414)	(0.0913)	(0.00964)
Full effect of violent conflict AC	-19.56%	-19.15%	-18.64%	-20.07%
Observations	84,187,954	101,005,598	84,187,954	101,005,598
Number of identifiers	3,226,028	4,819,898	3,226,028	4,819,898
R-squared within	0.6493	0.4896	0.6535	0.4937
R-squared between	0.8953	0.8868	0.8961	0.8986
R-squared overall	0.8277	0.8201	0.8297	0.8311
Maddison sample	YES	-	YES	-
WDI sample	-	YES	-	YES
Year dummies	-	-	YES	YES

Standard errors in parentheses
*** p<0.001, ** p<0.005, * p<0.01

Multiple conflicts and trade (Hypothesis 5)

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.542***	0.601***	0.524***	0.527***
	(0.000447)	(0.000498)	(0.000541)	(0.000599)
log GDP C	0.0185***	0.0604***	0.000201	-5.61e-05
	(0.000390)	(0.000440)	(0.000449)	(0.000503)
MID AB	-0.863***	-0.874***	-0.818***	-0.865***
	(0.00417)	(0.00574)	(0.00416)	(0.00572)
MID AC	-0.158***	-0.134***	-0.140***	-0.118***
	(0.00471)	(0.00630)	(0.00469)	(0.00628)
MID BC	-0.158***	-0.134***	-0.140***	-0.118***
	(0.00471)	(0.00630)	(0.00469)	(0.00628)
MID AC * conflict BC	0.390***	0.256***	0.342***	0.235***
	(0.0208)	(0.0317)	(0.0207)	(0.0315)
log trade AB	0.559***	0.490***	0.554***	0.487***
	(9.01e-05)	(8.69e-05)	(9.05e-05)	(8.71e-05)
Constant	-10.96***	-12.57***	-9.243***	-10.73***
	(0.00346)	(0.00413)	(0.0914)	(0.00963)
Full effect of violent conflict AC	33.08%	16.63%	27.71%	15.36%
Observations	84,187,954	101,005,598	84,187,954	101,005,598
Number of identifiers	3,226,028	4,819,898	3,226,028	4,819,898
R-squared within	0.6492	0.4896	0.6535	0.4937
R-squared between	0.8938	0.8847	0.8949	0.8971
R-squared overall	0.8260	0.8179	0.8284	0.8293
Maddison sample	YES	-	YES	-
WDI sample	-	YES	-	YES
Year dummies	-	-	YES	YES

Standard errors in parentheses
*** p<0.001, ** p<0.005, * p<0.01

Conflict, trade, and trade dependency (Hypothesis 6)

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.598***	0.614***	0.552***	0.512***
	(0.000551)	(0.000592)	(0.000658)	(0.000703)
log GDP C	0.0394***	0.0964***	-0.00563***	-0.00134
	(0.000514)	(0.000555)	(0.000606)	(0.000652)
MID AB	-0.744***	-0.820***	-0.748***	-0.814***
	(0.00514)	(0.00665)	(0.00511)	(0.00662)
MID AC	-0.154***	-0.166***	-0.156***	-0.153***
	(0.00555)	(0.00702)	(0.00552)	(0.00699)
MID BC	-0.152***	-0.152***	-0.150***	-0.141***
	(0.00526)	(0.00669)	(0.00523)	(0.00666)
trade dependency AB, BA	0.0300***	0.0345***	0.0312***	0.0368***
	(7.55e-05)	(9.07e-05)	(7.54e-05)	(9.06e-05)
trade dependency AC, BC	-0.000660***	-0.00153***	0.000091	0.000133
	(9.86e-05)	(0.000110)	(9.83e-05)	(0.000110)
trade dependency CA, CB	0.00241***	0.00446***	0.00291***	0.00614***
	(7.49e-05)	(8.89e-05)	(7.47e-05)	(8.88e-05)
MID AC * dependency BA	0.000707	0.00692***	0.00206***	0.00617***
	(0.000626)	(0.00104)	(0.000623)	(0.00103)
log trade AB	0.521***	0.474***	0.516***	0.470***
	(0.000110)	(0.000104)	(0.000111)	(0.000104)
Constant	-12.42***	-13.33***	-10.77***	-10.54***
	(0.00443)	(0.00488)	(0.0261)	(0.0118)
Full effect of violent conflict AC,				
given dependency BA of 0	-14.27%	-15.30%	-14.44%	-14.19%
given dependency BA of 10	-13.57%	-8.35%	-12.38%	-8.00%
given dependency BA of 50	-10.74%	19.43%	-4.13%	16.76%
Observations	62,867,412	75,384,774	62,867,412	75,384,774
Number of identifiers	2,705,232	3,610,858	2,705,232	3,610,858
R-squared within	0.6288	0.5033	0.6332	0.5079
R-squared between	0.8908	0.8941	0.8967	0.9108
R-squared overall	0.8276	0.8317	0.8336	0.8469
Maddison sample	YES	-	YES	-
WDI sample	-	YES	-	YES
Year dummies	-	-	YES	YES

Standard errors in parentheses
*** p<0.001, ** p<0.005, * p<0.01

Conflict, trade, and trade dependencies (Hypothesis 7)

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB
log GDP A, B	0.598***	0.614***	0.552***	0.512***
	(0.000551)	(0.000592)	(0.000658)	(0.000703)
log GDP C	0.0394***	0.0964***	-0.00563***	-0.00140***
	(0.000514)	(0.000555)	(0.000606)	(0.000652)
MID AB	-0.743***	-0.821***	-0.748***	-0.814***
	(0.00514)	(0.00665)	(0.00511)	(0.00662)
MID AC	-0.143***	-0.150***	-0.145***	-0.138***
	(0.00545)	(0.00690)	(0.00542)	(0.00687)
MID BC	-0.153***	-0.152***	-0.150***	-0.141***
	(0.00526)	(0.00669)	(0.00523)	(0.00666)
trade dependency AB, BA	0.0300***	0.0345***	0.0312***	0.0368***
	(7.55e-05)	(9.07e-05)	(7.54e-05)	(9.06e-05)
trade dependency AC, BC	-0.000670***	-0.00153***	0.000085	0.000133
	(9.86e-05)	(0.000110)	(9.83e-05)	(0.000110)
trade dependency CA, CB	0.00241***	0.00446***	0.00290***	0.00614***
	(7.49e-05)	(8.89e-05)	(7.47e-05)	(8.88e-05)
MID AC * dependency BC	-0.00558***	-0.00143	-0.00266***	-0.00214
	(0.000836)	(0.00131)	(0.000833)	(0.00130)
log trade AB	0.521***	0.474***	0.516***	0.470***
	(0.000110)	(0.000104)	(0.000111)	(0.000104)
Constant	-12.42***	-13.33***	-10.77***	-10.54***
	(0.00443)	(0.00488)	(0.0261)	(0.0118)
Full effect of violent conflict AC,				
given dependency BC of 0	-13.33%	-13.93%	-13.50%	-12.89%
given dependency BC of 10	-18.89%	-15.36%	-16.15%	-15.03%
given dependency BC of 50	-41.15%	-21.07%	-26.78%	-23.57%
Observations	62,867,412	75,384,774	62,867,412	75,384,774
Number of identifiers	2,705,232	3,610,858	2,705,232	3,610,858
R-squared within	0.6288	0.5033	0.6332	0.5079
R-squared between	0.8908	0.8941	0.8967	0.9108
R-squared overall	0.8276	0.8317	0.8336	0.8469
Maddison sample	YES	-	YES	YES
WDI sample	-	YES	-	-
Year dummies	-	-	YES	YES

Standard errors in parentheses
*** p<0.001, ** p<0.005, * p<0.01

International Political Economy I

- Liberalism
  - David Ricardo's comparative advantage
  - Potential trade losses prevent states from engaging in conflict

- Mercantilism
  - National security as the ultimate goal of a state
  - Economics is subordinated to politics; wealth subordinated to security
  - Trade as a zero sum game
  - Dependencies create vulnerability
  - Tensions and conflicts arise over disagreements in trade politics

International Political Economy II

- Marxism
  - Asymmetrical economic relationships produce dependencies
  - Conflicts between industrialized and poor/dependent states
  - Conflicts between imperialistic states about markets
  - Politics is subordinated to economics

International Political Economy III

- Realism
  - Similar to Mercantilism, as the ultimate goals of a state are power and security
  - The international system is anarchic
  - States are the central actors
- Constructivism
  - Aspects of international relations are socially constructed
  - Ideas and social interaction rather than materialism and power politics
  - Less prominent in IPE
- Rationalism
  - Importance of international organizations and international law
  - Expected costs and benefits of war

Empirical Findings I

1) Trade promotes peace
   - Predominant finding in conflict and trade research
   - Built on the ideas of Liberalism
   - Tested with different goods, dependency asymmetries, and different control variables
2) Trade promotes conflict and mixed results
   - Built on Mercantilist and Marxist ideas of asymmetries and dependencies
   - Claim that conflict and peace are not necessarily the two extreme values of the same variable
   - Depends from case to case

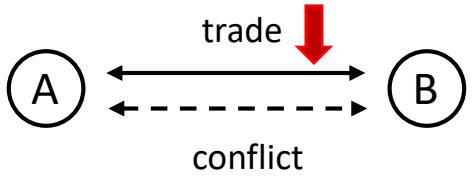
Gravity Model of Trade

$$T_{ij} = \frac{\beta_0 Y_i^{\beta_1} Y_j^{\beta_2}}{D_{ij}^{\beta_3}}$$

- Prominent model in trade and trade-conflict research
- Broad empirical support
- Analogy to Newton's law of gravity theory: "Just as the gravitational attraction between any two objects is proportional to the product of their masses and diminishes with the distance, the **trade between any two countries is**, other things equal, **proportional to the product of their GDPs and diminishes with distance**." (Krugman et al., 2015)

Dyadic Setting I

- As a baseline: testing the effect of bilateral conflict on bilateral trade
- Following the existing literature (Li & Sacko 2002, Long 2008, Keshk et al. 2010)
- Hypothesis 1: Violent conflict between country A and country B reduces their bilateral trade with each other.

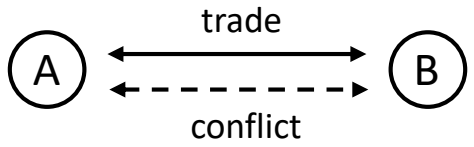


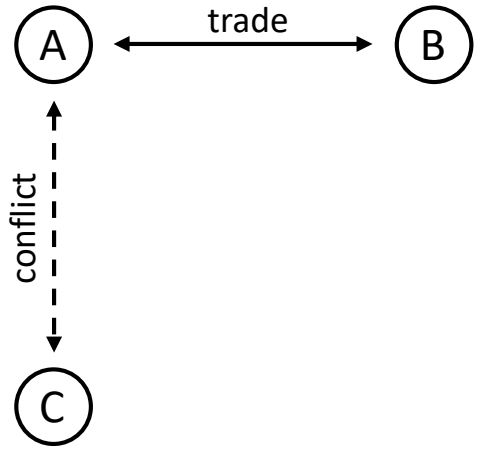
Dyadic Setting II

- Reduction of production possibilities
- Additional risks costs
- Political/ideological decisions
- Different levels of actors: governments, companies, interest groups, and individuals
- Here: State as a unitary actor

Triadic Setting

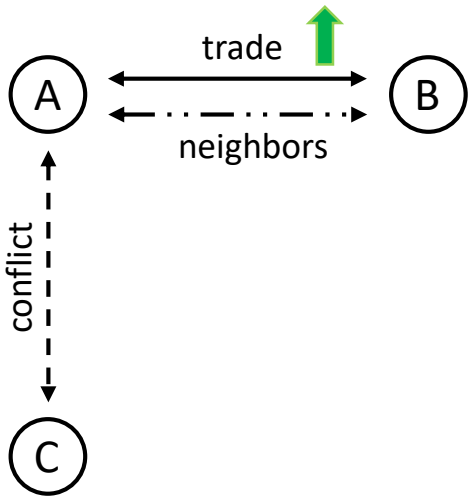
- A third country is added to the analysis
- Depends on the relationship between the countries
- Relationship constellations
  - Contiguity
  - Formal security alliances
  - Common conflicts
  - Trade dependency





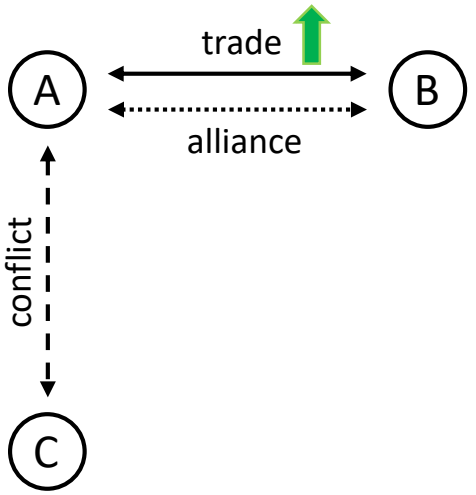
Geographic Contiguity

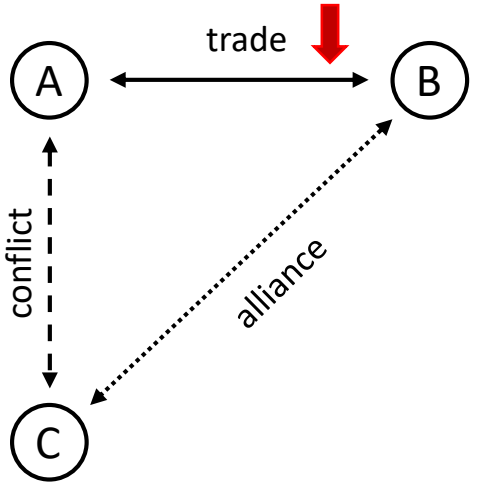
- Hypothesis 2: Violent conflict between country A and country C **increases bilateral trade** between country A and country B, if **country A and country B are neighbors**.
- Trade requires stable networks of exporters and importers
  - Costs of creating a foreign contact
  - Costs of direct interaction with existing foreign contacts



Formal Security Alliances

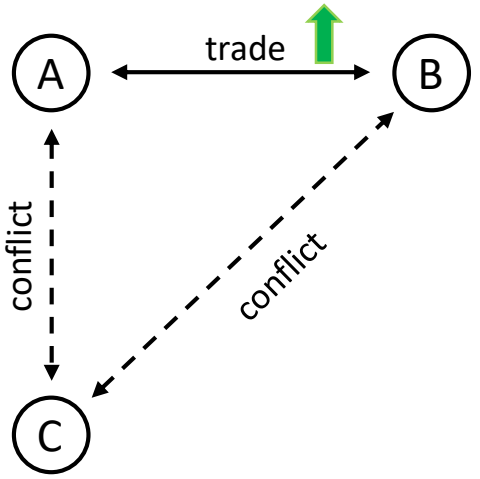
- Hypothesis 3: Violent conflict between country A and country C **increases bilateral trade** between country A and country B, if **country A and country B are formal allies**.
- Hypothesis 4: Violent conflict between country A and country C **decreases bilateral trade** between country A and country B, if **country and country C are formal allies**.
- General interest in the allies' wellbeing
  - Trade as a non-military support of allied countries
  - Positive security externalities of trade





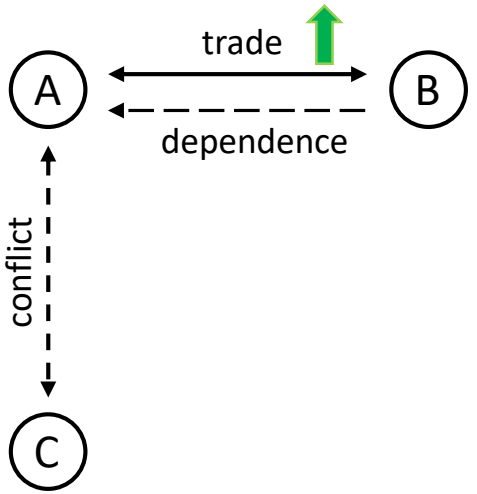
Common Conflict

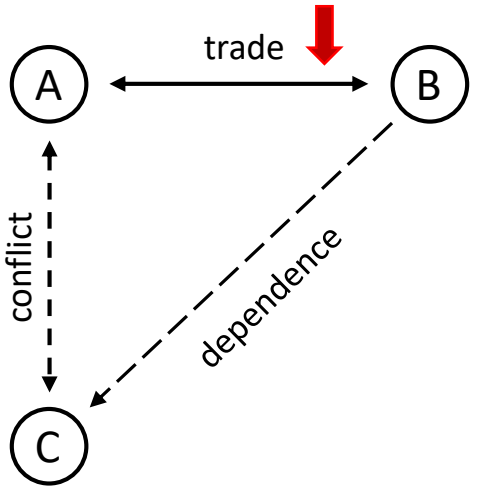
- Harm the common enemy by supporting each other
- Trade as a non-military support
- Hypothesis 5: Violent conflict between country A and country C increases bilateral trade between country A and country B, if country B and country C have a violent conflict with each other too.



Trade Dependency

- Trade dependency creates vulnerability to sudden interruptions in trade
- Dependent countries are exposed to (the threads of) coercive measures
- Hypothesis 6: Violent conflict between country A and country C increases bilateral trade between country A and country B, if country B is trade-dependent on country A.
- Hypothesis 7: Violent conflict between country A and country C decreases bilateral trade between country A and country B, if country B is trade-dependent on country C.





Summary Statistics, Triadic Sample

Variable	Description	Scale	N	Mean	Std. Dev.	Min	Max
log trade AB	log of the total trade value (imports + exports) between country A and B	continuous	179,560,088	1.25793	3.5961	-22.11	13.372
violent conflict AB, AC, BC	Presence of a violent conflict between countries A and B, A and C, or B and C	binary, 0 or 1	235,141,982	0.00052	0.0228	0	1
log distance AB, AC, BC	log of the distance between the most populous cities of country A and B, A and C, or B and C	continuous	219,605,519	8.73371	0.7826	3.572	9.892
log GDP (Maddison)	log of GDP, data from Maddison Project	continuous	145,487,998	10.0778	2.0323	3.829	16.065
log GDP (WDI)	log of GDP, data from WDI	continuous	158,306,362	9.84611	2.4394	3.065	16.576
contiguity AB, AC, BC	Direct geographic contiguity or uninterrupted distance of up to 400 miles of water between countries A and B, A and C, or B and C	binary, 0 or 1	235,141,982	0.04529	0.208	0	1
alliance AB, AC, BC	Formal security alliance, including ententes, non-aggression treaties, neutrality treaties, and defense treaties, between countries A and B, A and C, or B and C	binary, 0 or 1	229,551,276	0.08609	0.2805	0	1
dependency AB	Total trade between country A and B as a share (in percentage) of country A's total trade	continuous, 0-100	152,415,433	0.93441	4.2629	0	100
dependency BA	Total trade between country A and B as a share (in percentage) of country B's total trade	continuous, 0-100	152,415,433	0.93441	4.2629	0	100
dependency AC	Total trade between country A and C as a share (in percentage) of country A's total trade	continuous, 0-100	152,223,552	0.76661	3.3433	0	100
dependency BC	Total trade between country B and C as a share (in percentage) of country B's total trade	continuous, 0-100	152,223,552	0.76661	3.3433	0	100
dependency CA	Total trade between country A and C as a share (in percentage) of country C's total trade	continuous, 0-100	152,098,706	0.93767	3.9613	0	100
dependency CB	Total trade between country B and C as a share (in percentage) of country B's total trade	continuous, 0-100	152,098,706	0.93767	3.9613	0	100

Hypothesis 1 with GMM Estimation

Table 13: Dyadic analysis with GMM estimation (hypothesis 1)

VARIABLES	(1) log trade AB	(2) log trade AB	(3) log trade AB	(4) log trade AB	(5) log trade AB	(6) log trade AB
violent conflict	-1.260***	-0.523***	-1.253***	-0.921***	-0.981***	-1.387***
	(0.0584)	(0.0876)	(0.0584)	(0.0471)	(0.0583)	(0.0784)
log GDP	1.246***	1.203***	1.257***	0.365***	1.200***	0.197***
	(0.00404)	(0.00355)	(0.00572)	(0.00189)	(0.00512)	(0.00529)
log distance	-1.510***	-1.481***	-	-0.446***	-1.496***	-0.0759***
	(0.0174)	(0.0148)		(0.00439)	(0.0159)	(0.0136)
log trade t-1	-	-	-	0.688***	-	0.808***
				(0.000927)		(0.119)
Constant	-12.56***	-11.69***	-25.34***	-3.451***	-9.915***	-3.134***
	(0.153)	(0.136)	(0.0350)	(0.0414)	(0.707)	(0.00331)
Observations	620,296	662,964	620,296	587,456	620,296	570,096
Number of identifiers	21,142	26,286	21,142	20,598	21,142	20,520
R-squared within	0.4973	0.3355	0.4973	0.6848	0.5099	-
R-squared between	0.6203	0.7322	0.4987	0.9487	0.6139	-
R-squared overall	0.5877	0.6590	0.4919	0.8728	0.5899	-
Maddison sample	YES	YES	-	YES	YES	YES
WDI sample	-	-	YES	-	-	-
Lagged regressors	-	-	-	-	YES	-
Year dummies	-	-	-	-	-	-
Fixed effects	-	-	-	YES	-	-
Random effects	YES	YES	YES	-	YES	-
GMM estimation	-	-	-	-	-	YES

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

GMM and Nickell Bias

- "[…] $y_{i,t-1}$ is correlated with the fixed effects in the error term, which gives rise to 'dynamic panel bias'", or Nickell Bias (Roodman 2009)

Computational Times

Table 1: Computational Regression Times

Table	Column	Time (minutes)	Table	Column	Time (minutes)
Table 4	column 1	2.14	Table 9	column 1	246.34
	column 2	1.41		column 2	267.61
	column 3	2.29		column 3	119.27
	column 4	1.44		column 4	240.67
	total	**7.27**		column 5	1424.59
				total	**2298.49**
Table 5	column 1	2.10			
	column 2	2.23	Table 10	column 1	230.44
	column 3	2.23		column 2	243.14
	column 4	2.33		column 3	120.76
	total	**8.89**		column 4	223.79
				column 5	1641.46
Table 6	column 1	12.11		**total**	**2459.60**
	column 2	6.21			
	column 3	7.66	Table 11	column 1	246.35
	column 4	3.99		column 2	265.18
	total	**29.98**		column 3	119.90
				column 4	240.93
Table 7	column 1	244.44		column 5	1202.99
	column 2	218.62		**total**	**2075.35**
	column 3	249.92			
	column 4	110.04	Table 12	column 1	252.76
	column 5	250.11		column 2	269.61
	column 6	1065.97		column 3	125.09
	total	**2139.11**		column 4	237.42
				column 5	1402.20
Table 8	column 1	246.50		**total**	**2287.08**
	column 2	265.90			
	column 3	125.80			
	column 4	245.73			
	column 5	1242.59			
	total	**2126.52**			

Total time for all regressions (minutes)	**13432.28**
Total time for all regressions (hours)	**223.87**

Interpretation of Coefficients

- In a log-log regression model, a 1% change in the independent variable corresponds to a change of 1.01^β % in the dependent variable.
- In a regression model with a logarithmic dependent variable and a dichotomous independent variable, a change in the independent variable from 0 to 1 corresponds to a change of (e^β − 1) $*$ 100 % in the dependent variable.
- Full effect for dependency: (e^β_8 − 1) $*$ 100 + (e^β_16 − 1) $*$ 100 $*$ dep_ba , where β_8 is the coefficient for violent conflict AC and β_16 the coefficient for the interaction term.