Modeling Trade Tensions: Different Mechanisms in General Equilibrium

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Overview

- Motivation
- Two GE frameworks used for trade policy analysis
- Results in the two frameworks
- Main transmission channels
- Exercise: combine the two approaches
- Concluding remarks

Motivation

- Escalation of trade tensions has spurred analysis
- Analysis relied mainly on two different approaches
- Trade economists often rely on CGE models
- Others exploit DSGE frameworks
- What do these two frameworks measure when it comes to trade tariffs?

Previous studies

- Macro literature: Erceg, Prestipino, Raffo (2018); Ecerg, Guerrieri, Gust (2006); Linde, Pescatori (2017)
- Trade literature: Caliendo, Feenstra, Romalis, Taylor (2017); Bekkers, Teh (2019)
- Macro literature focuses on dynamic models, limited sectoral details
- Trade literature has a multi-country approach, rich sectoral details, but no dynamics
- Our paper relates to both strands of literature

A DSGE model: GIMF

- IMF GIMF as lab to study DSGE frameworks

- It is a complex set of layers and decision rules

  1. Multi-country (USA, China, Asia, Euro, Japan, RoW)
  2. Non-Ricardian households
  3. Real and nominal rigidities
  4. Different currency pricing
  5. Dynamic consistency

A CGE model: GTAP

- Purdue GTAP as lab to study CGE frameworks

- It is a complex system of equations

  1. Multi-country (USA, China, Asia, Euro, Japan, RoW)
  2. Sectoral disaggregation (13 sectors)
  3. Input/output structure
  4. Comparative static analysis
  5. Fixed endowment of production factors

Stylized experiment

- Bilateral 10 ppt increase in US and China import tariffs
- Both models yield negative outcomes for the two countries
- Loss of exports, decline in GDP
- In GIMF, even with retaliation:

  1. Asymmetric trade volumes and responses
  2. Net appreciation of the ER for the US
  3. Depreciation for China

GIMF results: mechanisms

- In the LR, results driven mostly by distortion of investment

- In SR, results affected by movements in exports/ER

- Response in the SR depends on:

  1. Currency invoicing (rigidities in pricing: LCP vs PCP)
  2. (Deep and policy) parameters
  3. Nominal and real rigidities
  4. Elasticity of substitution
  5. How the revenue from tariffs is used

To simplify: three main equations

Relative demand for foreign varieties

$$\frac{y_t^M}{y_t^H} = f\left(\tau_m, \epsilon_t, \frac{P_t^*}{P_t}\right)$$

Balance of payments

$$B_t^F = g\left(B_{t-1}^F, P_t^M, Y_t^M, P_t^X, Y_t^X, \tau_m, \tau_m^*, \epsilon_t\right)$$
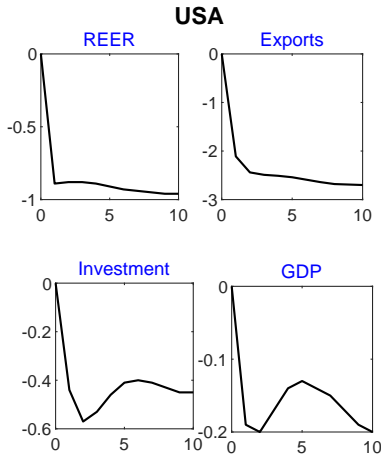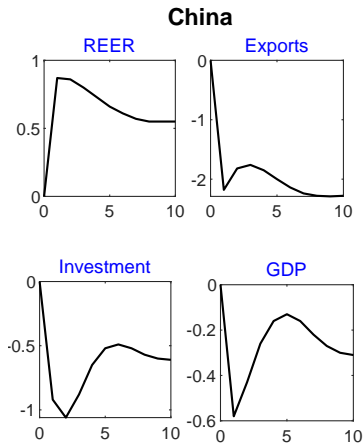
Intertemporal condition for foreign bond holdings

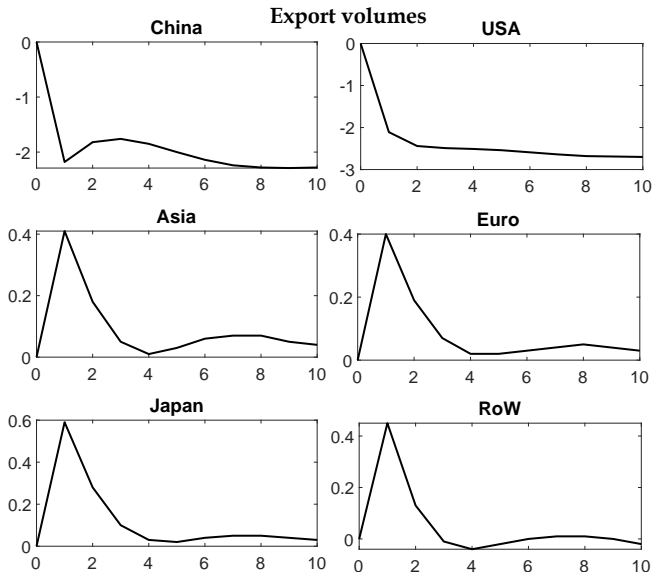$$1 = \beta E_t\left[\Lambda_{t,t+1}\frac{P_t}{P_{t+1}}\frac{\epsilon_{t+1}}{\epsilon_t}R_t^*\right]$$

Tariffs do not affect (directly) last equation: exchange rate (ϵ) jumps to preserve dynamic consistency
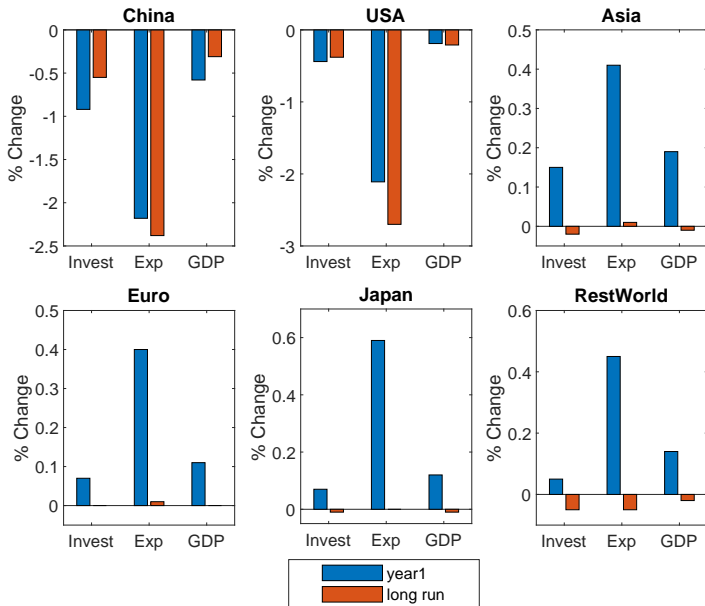
Less simplified mechanism: UIP condition

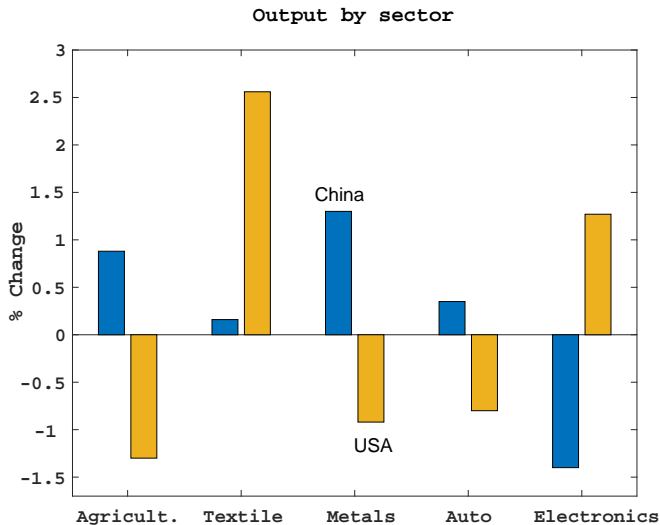# GIMF: mechanisms of a tariff increase

Trade diversion

Long run dynamics

GTAP results: mechanisms

- Tariffs introduce a wedge in relative prices
- Sectors more exposed to trade lose competitiveness
- This generates a contraction of production factor demand
- But total stock of production factors is fixed
- Prices fall to support full employment, given higher tariffs
- Demand for output of other sectors increases
- The input/output structure governs propagation
- Resources reallocate across sectors
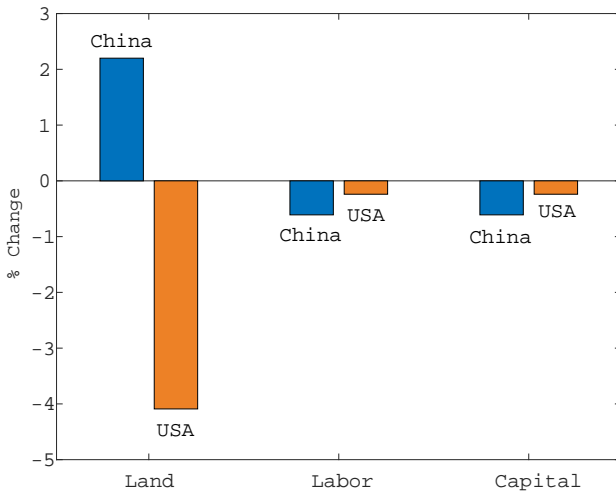- Δ(factor prices) measures the inefficiency of new allocations
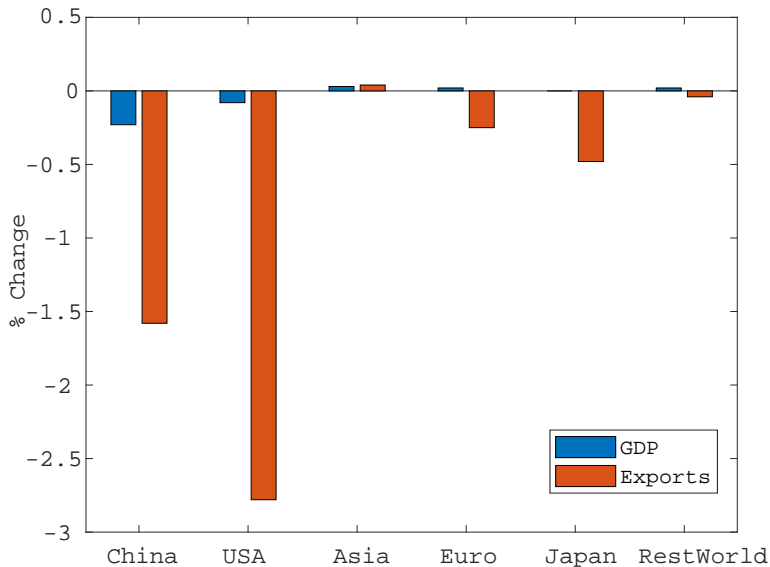
Sectoral reallocation in the U.S. and China

Output by sector

Sectoral realloction in other countries

Output by sector
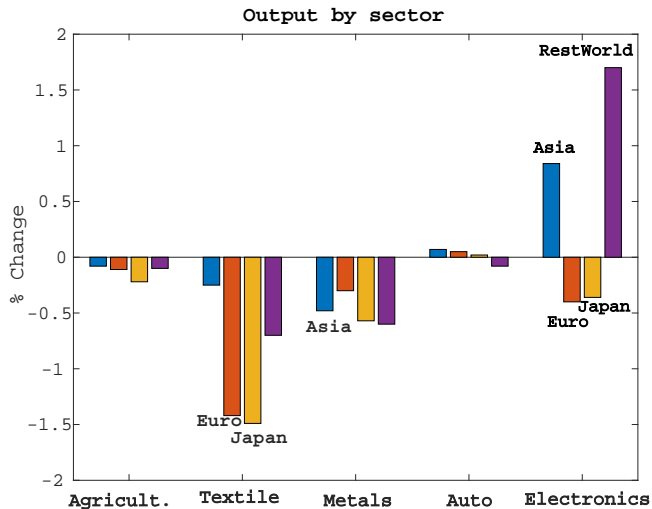
Real returns on production factors

GDP and exports

Trade diversion GIMF-GTAP

GIMF

	Asia	China	Euro	Japan	RestWorld	USA
To Asia		1.3	-0.2	-0.0	-0.2	-1.3
To China	-1.3		-1.5	-1.3	-1.5	**-22.6**
To Euro	0.2	1.5		0.2	-0.0	-1.1
To Japan	0.0	1.3	-0.2		-0.2	-1.3
To RestWorld	0.2	1.5	0.0	0.2		-1.1
To USA	1.5	**-17.2**	1.3	1.5	1.3	

GTAP

	Asia	China	Euro	Japan	RestWorld	USA
To Asia	-1.2	6.7	-0.8	-1.7	-0.7	7.5
To China	-1.0		-0.7	-1.6	-0.6	**-43.8**
To Euro	-0.7	7.6	-0.4	-1.0	-0.6	1.4
To Japan	-1.2	6.1	-1.1		-0.7	0.8
To RestWorld	-0.8	7.2	-0.7	-1.0	-0.8	1.1
To USA	7.5	**-39.2**	4.4	4.6	3.0	

Positive exercise: combining the estimates

- Tariff effects in GTAP measure inefficiency of resource reallocation
- Absent multiple sectors in GIMF, how much could we miss?
- Interpret real GDP results in GTAP in terms of an aggregate production function
- Given the constraint on factors: changes in GDP as changes in productivity (residual)
- Impose a shock to aggregate productivity in GIMF, using GTAP estimates
- Main caveat: this could lead to overestimate of impact
- Measure how much *larger* the effects of a tariff could be

Combined shocks: adding TFP shock in GIMF
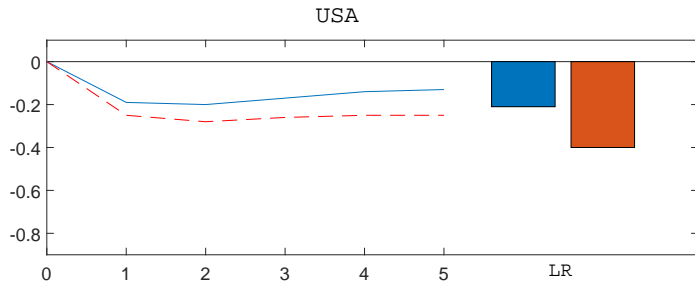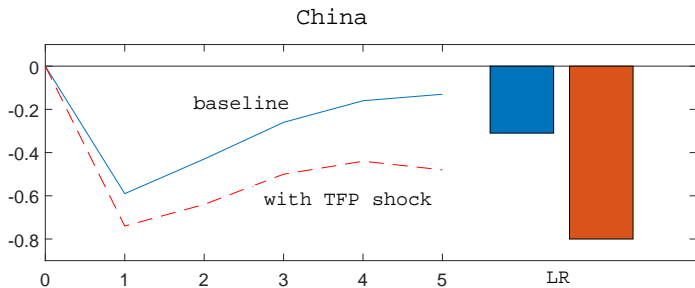
Concluding remarks

- Two models ask complementary questions about tariff distortions

- DSGE (GIMF): What is the impact on total resources?

- CGE (GTAP): What is the impact if resources are fixed but need to be reallocated?

- Different channels imply different overall effects

- Absent multiple sectors in GIMF, how much could we miss?

- Exercise: combine estimates from the two models
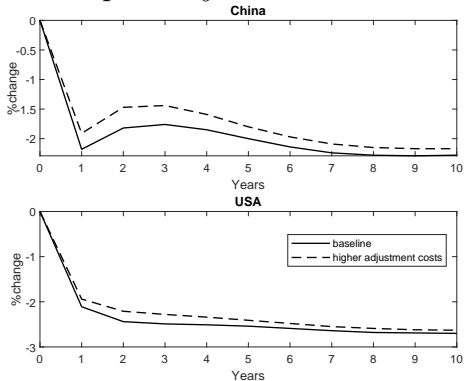
- Impact of tariffs could be much larger

Back-up slides

Price and quantity rigidities
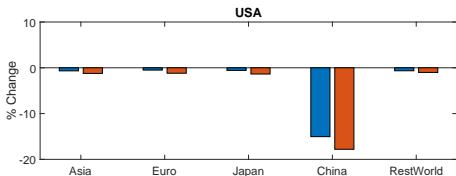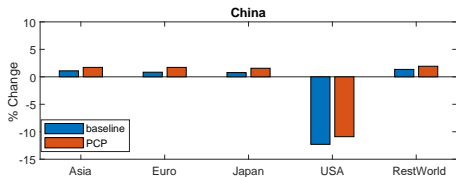
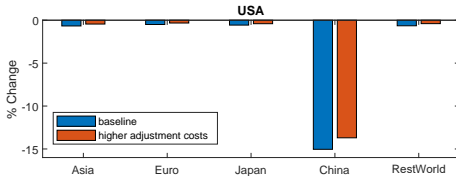LCP(high pass-through) v. PCP
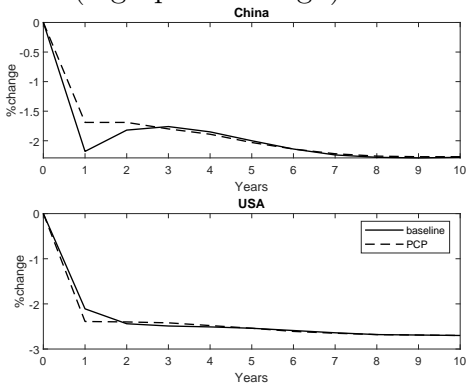
Import adjustment costs

Trade diversion with different rigidities

LCP(high pass-through) v. PCP

Import adjustment costs
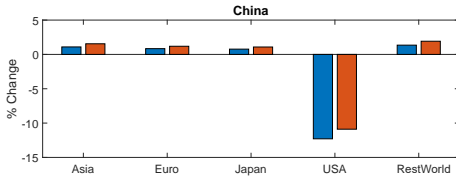
Sectoral trade linkages

China exports to the U.S.

Others · Textiles · Light manuf. · Electronics · Heavy manuf.

U.S. exports to China

Others · Crops and food · Services · Light manufact (incl. textiles) · Heavy manufact. (incl. **automobile**)
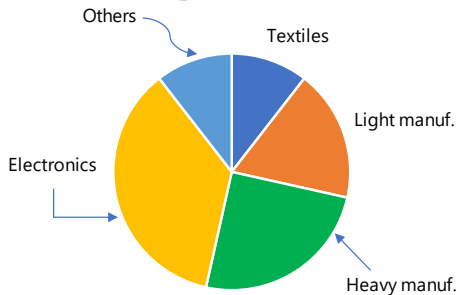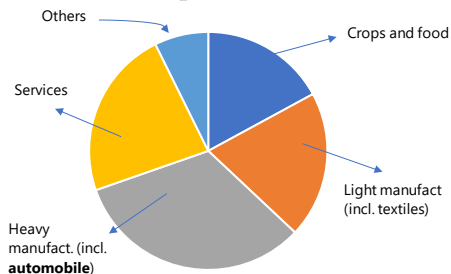
Trade matrix

GIMF

	Asia	China	Euro	Japan	RestWorld	US
To Asia		25.4	7.8	26.6	19.6	12
To China	19.5		8.2	22.8	20.4	10
To Euro	8.5	17.1		8.9	32.6	14
To Japan	5.9	8.8	2.6		5.1	4.
To RestWorld	54.9	24.2	68.0	23.3		58
To USA	11.3	24.4	13.4	18.3	22.3	

GTAP

	Asia	China	Euro	Japan	RestWorld	US
To Asia	22.8	22.4	5.5	27.8	12.2	12
To China	20.9		4.5	25.9	9.0	8.
To Euro	10.2	13.2	41.5	9.0	25.3	17
To Japan	7.1	8.2	1.5		4.4	5.
To RestWorld	26.4	37.5	39.4	21.5	31.6	56
To USA	12.5	18.7	7.5	15.8	17.4	

Trade diversion SR v. LR

- Larger trade diversion in the SR (year 1)

	Asia	China	Euro	Japan	RestWorld	USA
To Asia		1.3	-0.2	-0.0	-0.2	-1.3
To China	-1.3		-1.5	-1.3	-1.5	-22.6
To Euro	0.2	1.5		0.2	-0.0	-1.1
To Japan	0.0	1.3	-0.2		-0.2	-1.3
To RestWorld	0.2	1.5	0.0	0.2		-1.1
To USA	1.5	-17.2	1.3	1.5	1.3	

	Asia	China	Euro	Japan	RestWorld	USA
To Asia		1.5	0.0	0.1	0.0	-0.7
To China	0.5		1.0	0.9	0.3	-19.5
To Euro	0.1	1.2		0.1	0.0	-0.5
To Japan	0.0	1.1	-0.1		0.0	-0.6
To RestWorld	0.2	1.9	0.1	0.3		-0.6
To USA	2.8	-16.2	2.9	2.9	2.6	

Sectoral exports
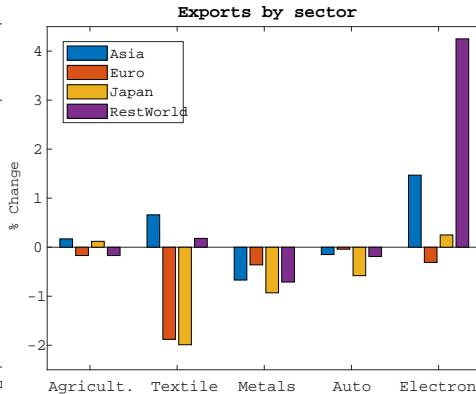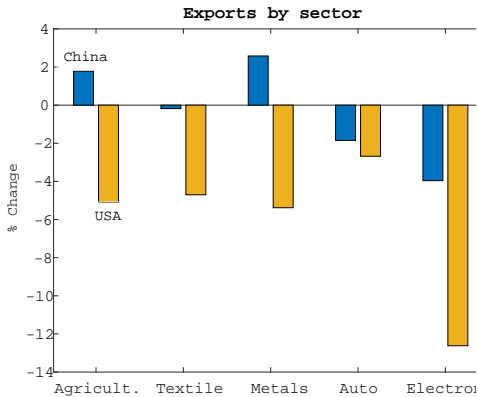
Sensitivity to different elasticities

Combining shocks