Import Tariffs and Global Sourcing

Pol Antràs[1] Evgenii Fadeev[1] Teresa Fort[2] Agustín Gutiérrez[3], Felix Tintelnot[3]

[1]Harvard University

[2]Tuck at Dartmouth

[3]University of Chicago

January 4, 2021

Preliminary!

Motivation

- Significant unilateral tariff increases have become prevalent
- New US tariffs disproportionately target intermediate inputs (Bown and Zhang, 2019)
- Early empirical work suggests these tariffs harmed US manufacturing firms and workers
- Historically, tariffs tend to be higher for downstream goods (i.e., tariff escalation)
  - See Shapiro (2020) for a recent illustration

What explains tariff escalation?

- Neoclassical theory does not provide a rationale for why tariffs are higher on final goods
- Downstreamness and inverse export supply elasticities are *negatively* correlated
- This Paper: We explore optimal tariffs for final goods vs inputs in an environment with IRS, monopolistic competition, and product differentiation (Krugman, Venables, Ossa)
- Main Result: unilateral optimal tariffs are higher for final goods than for inputs

Main Contributions

- Two-sector closed-economy ‘Krugman economy’ with upstream and downstream sectors
  - Monopolistic competition in both sectors, with scale economies and free entry
  - Markups by upstream firms distort final-good producers mix of labor and inputs
  - A subsidy to input purchases undoes double-marginalization and restores efficiency
- Two-country open economy model with final-good and input tariffs
  - Quantitative evaluation of optimal final-good and input tariffs
  - First-order approximation around zero tariffs to tease out mechanisms
  - Input tariffs have larger de-location effects for final-good producers $\Rightarrow$ Tariff Escalation
- Future: counterfactual analysis of Trump tariffs on welfare

Related literature

- Optimal tariffs
  - Gros (1985); Bagwell and Staiger (1999, 2001), Venables (1987), Amiti (2004); Ossa (2011), Costinot et al. (2015); Lashkaripour (2020); Beshkar and Lashkaripour (2020), Costinot, Rodríguez-Clare, and Werning (2020)
- Trade policy with global value chains
  - Antràs and Staiger (2012); Caliendo et al. (2015); Blanchard, Bown, and Johnson (2017); Grossman and Helpman (2020); Caliendo and Parro (2020)
- Effects of recent trade war
  - Amiti, Redding, and Weinstein (2019); Fajgelbaum et al. (2020); Flaaen and Pierce (2020); Handley, Kamal, and Monarch (2020)

Outline of Talk

- Closed-economy model intuition
- Open economy with final-good and input tariffs
- Quantification of final-good versus input tariff effects

Closed Economy: Krugman 1980 with input and final-good sectors

- Two sectors: final-good and intermediate input sectors
- Consumers have CES preferences over final-good varieties (elasticity σ)
- Final goods production uses labor and a bundle of inputs to cover fixed & marginal costs
  - Production is Cobb-Douglas in inputs and labor, (labor share α)
  - Final-good sector features IRS, monopolistic competition, free entry, as in Krugman (1980)
- Intermediate input sector uses labor to cover fixed & marginal costs
  - Input sector also features IRS, monopolistic competition, free entry
  - Bundle of inputs is CES (elasticity θ)
  - Markups on inputs mean final-good sector uses too much labor relative to inputs

Closed Economy: Main Results

Proposition 1. In the decentralized equilibrium, firm-level output is at its socially optimal level in both sectors, but the market equilibrium features too little entry into both the downstream and upstream sectors unless $\alpha = 0$ (i.e., when the downstream sector does not use labor directly in production).

Proposition 2. The social planner can restore efficiency in the market equilibrium by subsidizing upstream production at a rate $(s^u)^* = 1/\theta$.

Open Economy: Allow for trade in both sectors

- Two-country extension with international trade in both final goods and inputs
- Trade is costly due to the presence of iceberg trade costs and import tariffs
  - τ^d and τ^u are iceberg trade costs applied to final goods and to inputs
  - t_i^d and t_i^u the tariffs set by country i on imports of final goods and intermediate inputs
- We rule out export tariffs and domestic instruments (consider domestic subsidies later)

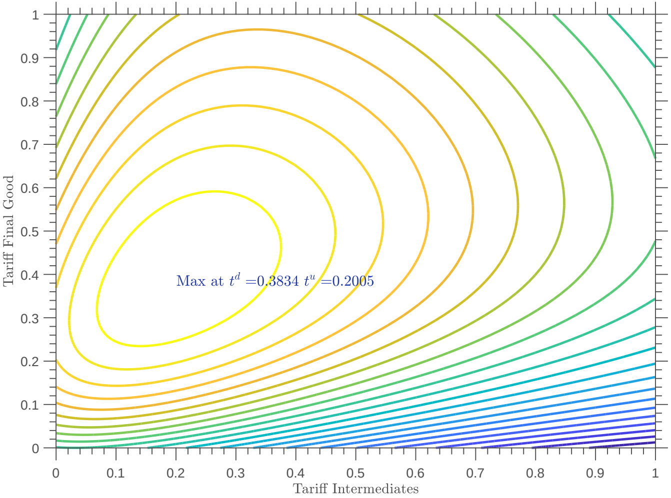
We calculate optimal tariffs by calibrating and estimating the model

- We study the **joint** determination of both optimal tariffs in a calibrated example
- Focus on the United States versus Rest of the World
- We calibrate 7 parameters using prior work or data (σ, θ, entry costs, α, population)
- We estimate 4 parameters to match moments of the data (mostly from CEPII and WIOD)

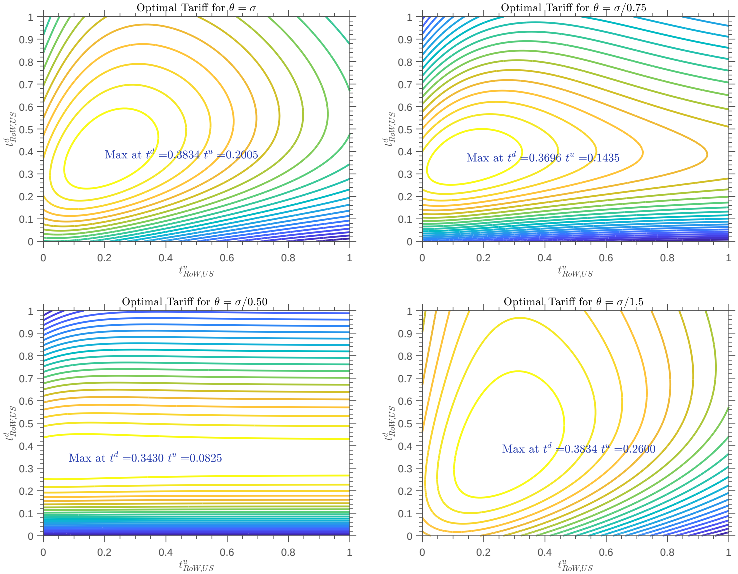
Calibrated and Estimated Parameters

A. Fixed Values		
θ	Elasticity of substitution, input varieties	4
σ	Elasticity of substitution, final-good varieties	4
f^d	Entry costs, final-good sector	1
f^u	Entry costs, input sector	1
B. Values Measured From Data		
$1-\alpha$	Expenditure on inputs relative to total sales	0.4517
L^{us}	Scaled population in US	0.4531
L^{row}	Scaled population in RoW	9.5469
C. Estimated Values		
A^d_{row}	Productivity in final-good sector, RoW relative to US	0.2728
A^u_{row}	Productivity in input sector, RoW relative to US	0.0538
τ^d	Iceberg cost for final goods from US to RoW	2.9177
τ^u	Iceberg cost for inputs from US to RoW	2.5877

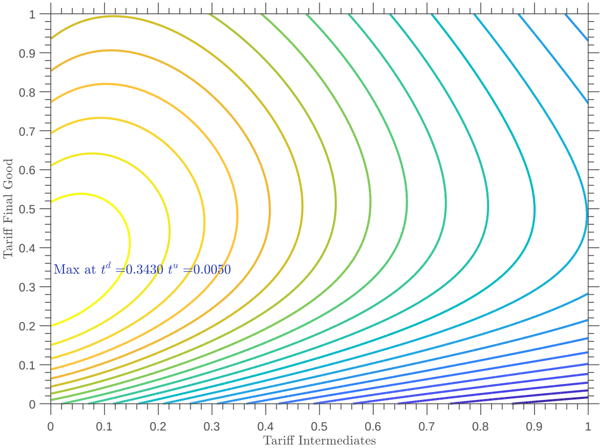
Optimal input tariff is lower than the final-good tariff



Tariff escalation is robust to other elasticity values

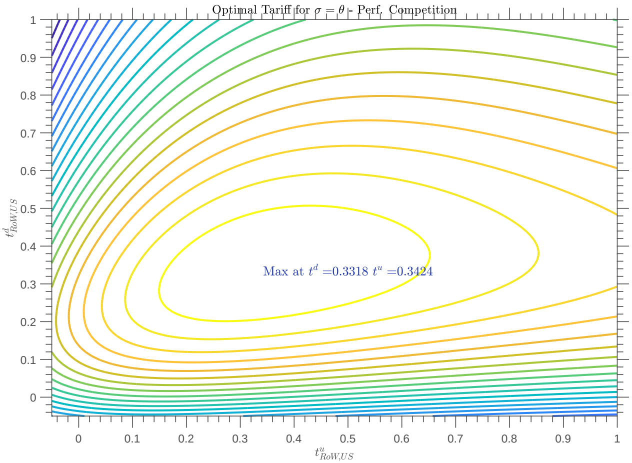


Tariff escalation persists with a domestic subsidy



- Optimal input tariff lower than final-good tariff, close to zero

Competitive benchmark does *not* feature tariff escalation

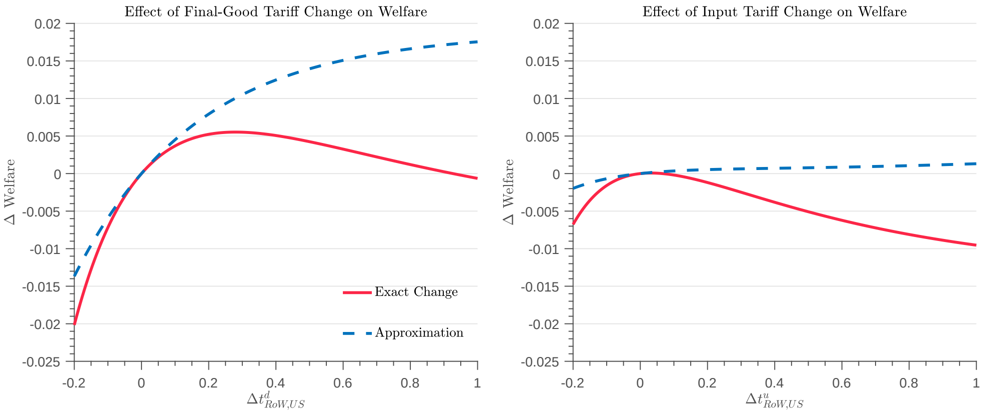


- With competitive markets and CRS close to uniform tariffs, slight tariff ‘de-escalation’

We analyze the welfare effects of a small tariff change

- Start from a zero-tariff equilibrium
- Hold one tariff fixed at zero (e.g., keep input tariff at zero)
- Calculate change in welfare from changing other tariff (e.g., change final-good tariff)
- Allows us to decompose the aggregate effect into various channels (terms of trade, relocation effects, etc.)

Approximation works well for small changes



- Negative welfare effects for large range of input tariffs

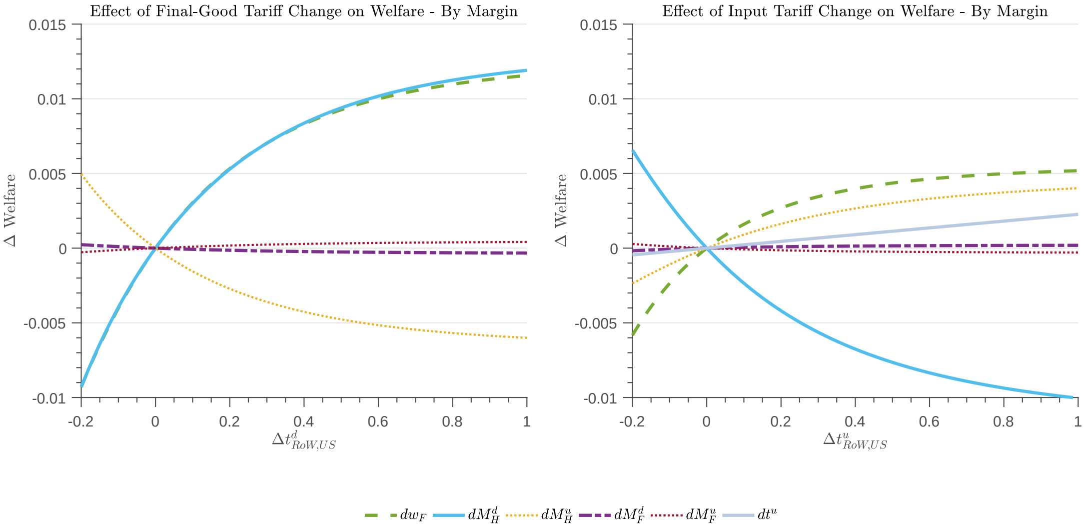
Decompose change in welfare

$$\begin{aligned}
\frac{dU_H}{U_H} = \quad & -\left(b_H^H \Omega_{F,H} + b_F^H \left(\Omega_{F,F} + \alpha\right)\right) \frac{dw_F}{w_F} && \leftarrow \text{Terms-of-trade effects} \\
& + \left(\frac{b_H^H \Omega_{H,H} + b_F^H \Omega_{H,F}}{\theta - 1}\right) \frac{dM_H^u}{M_H^u} && \leftarrow \text{Relocation of upstream firms to home} \\
& + \left(\frac{b_H^H \Omega_{F,H} + b_F^H \Omega_{F,F}}{\theta - 1}\right) \frac{dM_F^u}{M_F^u} && \leftarrow \text{Relocation of upstream firms to foreign} \\
\text{Relocation of downstream firms to home} \rightarrow \quad & + \left(\frac{b_H^H}{\sigma - 1}\right) \frac{dM_H^d}{M_H^d} \\
\text{Relocation of downstream firms to foreign} \rightarrow \quad & + \left(\frac{b_F^H}{\sigma - 1}\right) \frac{dM_F^d}{M_F^d} \\
\text{Input tariff re-exported to foreign} \rightarrow \quad & + \left(\lambda_H^d - b_H^H\right) \Omega_{F,H} (dt) \mathbb{I}_{\{t = t^u\}}
\end{aligned}$$

- Decomposes effect of a small change in one tariff from the zero-tariff equilibrium

▸ Derivations

Channels of tariffs' welfare effects differ by good type



New channels are quantitatively important

- We calculate the ratio of each component relative to a standard ToT effect
- Production relocation effects of FG producers are 0.98 of the ToT effect

Δ Tariff Range	dw_F	dM_H^d	dM_H^u	dM_F^d	dM_F^u	dt_u
$t_d \in [-0.05, 0.05]$	1	0.9828	-0.5132	-0.0257	0.0312	0
$t_u \in [-0.01, 0.01]$	1	-0.9826	0.5130	0.0257	-0.0312	≈ 0

Notes: Calculations based on the range of tariff changes for which the percentage deviation of the approximated versus exact change is less than 10%.

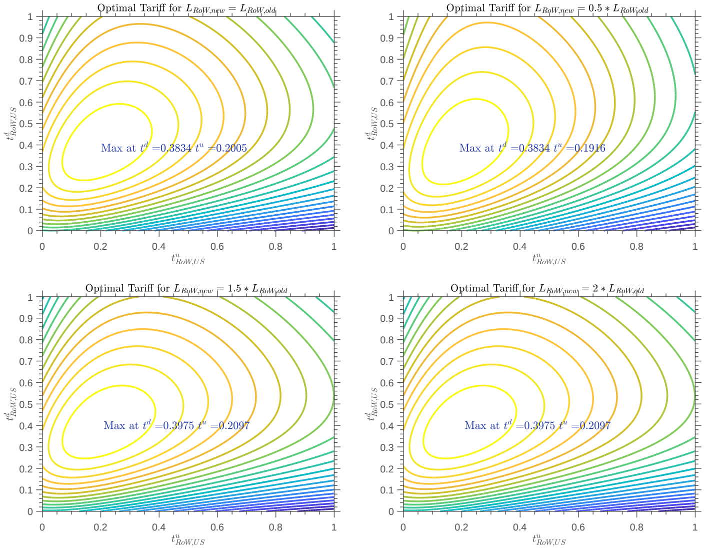
Conclusions

- We provide a rationale for tariff escalation – a prevalent feature of real-world tariffs
- Imperfect competition and free entry in final-good and input sectors seems crucial
- Tariffs on inputs affect the production decisions of final-good producers
  - Amount of labor vs input usage
  - Where to locate!
- Future: welfare effects of the Trump tariffs

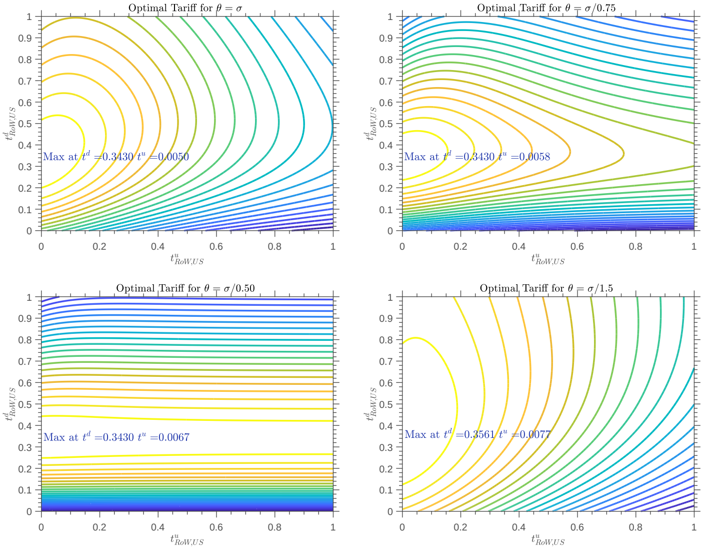
Moments

Description	Data	Model
Sales share to US from US in final goods	0.9644	0.9625
Sales share to RoW from RoW in final goods	0.9767	0.9823
Sales share to US from US in intermediate good	0.9209	0.9046
Sales share to RoW from Row in intermediate good	0.9762	0.9748
Expenditure share in US for US in final good	0.9337	0.9481
Expenditure share in RoW for RoW in final good	0.9850	0.9844
Expenditure share in US for US in int. good	0.9037	0.9285
Expenditure share in RoW for RoW in int. good	0.9798	0.9641
Total sales (ups. sector) to total expenditure (downs. sector) in US	0.7653	0.4607
Total sales (ups. sector) to total expenditure (downs. sector) in RoW	1.1192	0.4463
Total sales (downs. sector) to total expenditure (downs. sector) in US	0.9940	0.9937
Total sales (downs. sector) to total expenditure (downs. sector) in RoW	0.9987	0.9990
Total expenditure in downstream good in the US relative to RoW	0.3730	0.3602
Value of the Objective	0.5486	

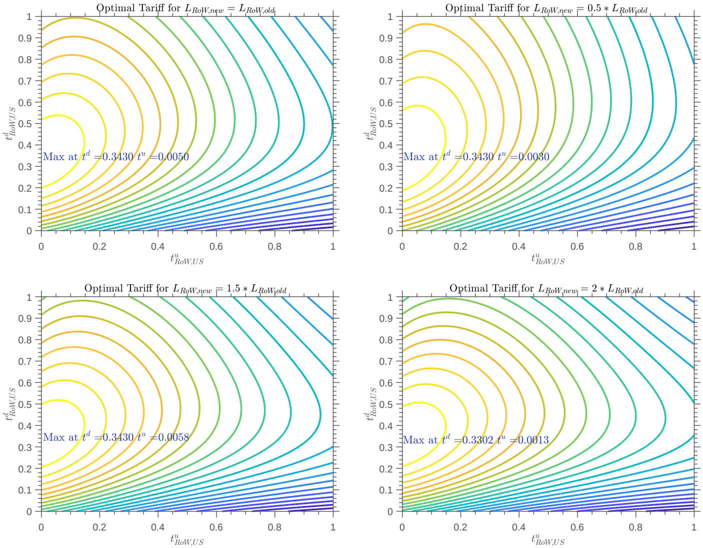
Sensitivity to country size differences



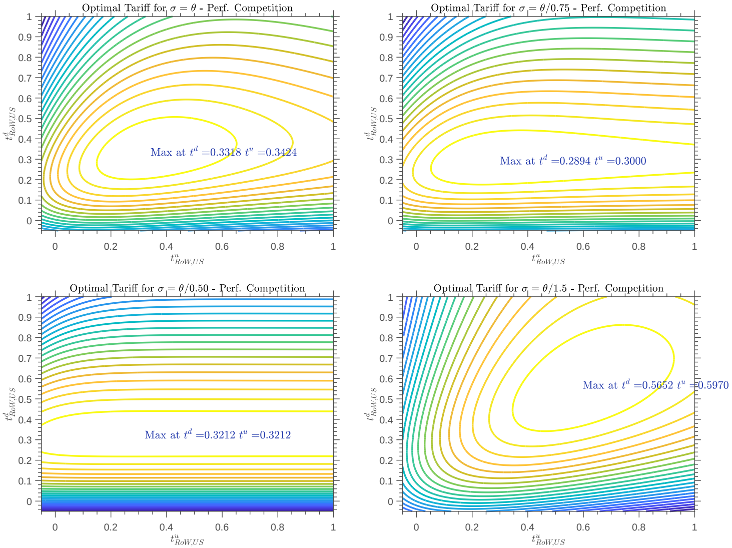
Sensitivity of domestic subsidies to elasticities



Sensitivity of domestic subsidies to country size differences



Sensitivity of competitive benchmark



Derivations for the welfare approximation

$$\frac{dU_H}{U_H} = \left[-\frac{dP_H}{P_H} + \frac{dR_H}{w_H L_H} \right], \tag{1}$$

$$\frac{dR_H}{w_H L_H} = b_F^H \times dt_H^d + \lambda_H^d \times \Omega_{F,H} \times dt_H^u, \tag{2}$$

$$\frac{dP_H}{P_H} = b_H^H \times \left(\frac{1}{1-\sigma} \frac{dM_H^d}{M_H^d} + \frac{dp_{H,H}^d}{p_{H,H}^d} \right) + b_F^H \times \left(\frac{dM_F^d}{M_F^d} \frac{1}{1-\sigma} + \frac{dp_{F,H}^d}{p_{F,H}^d} + dt_H^d \right) \tag{3}$$

$$\frac{dp_{i,i}^d}{p_{i,i}^d} = \alpha \frac{dw_i}{w_i} + (1-\alpha) \frac{dP_i^u}{P_i^u}, \tag{4}$$

$$(1-\alpha) \frac{dP_i^u}{P_i^u} = \left(\frac{dM_i^u}{M_i^u} \frac{1}{1-\theta} + \frac{dp_{i,i}^u}{p_{i,i}^u} \right) \Omega_{i,i} + \left(\frac{dM_j^u}{M_j^u} \frac{1}{1-\theta} + \frac{dp_{j,i}^u}{p_{j,i}^u} + dt_i^u \right) \Omega_{j,i} \tag{5}$$

Back