Profits, Scale Economies, and the Gains from Trade and Industrial Policy

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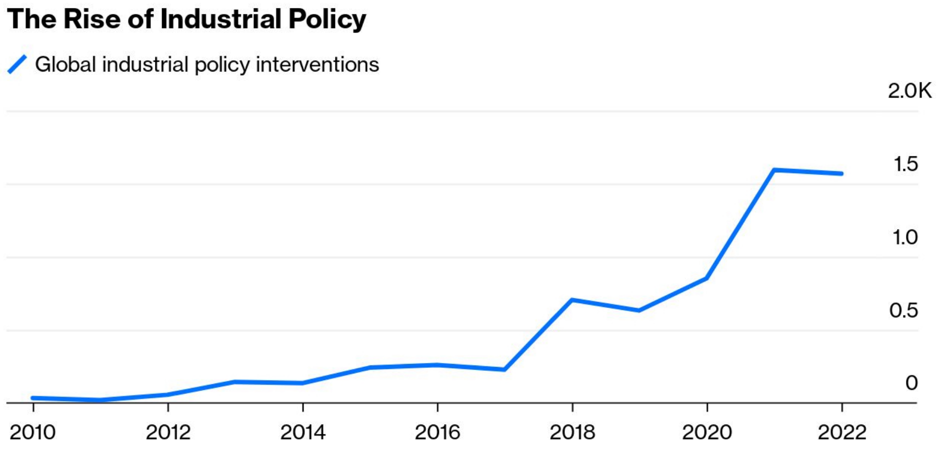
Industrial Policy is on the Rise Globally



Source: "The New Economics of Industrial Policy," Reka Juhasz, Nathan Lane and Dani Rodrik, NBER (2023), figure 3.1

Trade Restrictions Being Used to Pursue Industrial Policy Objectives

Made in China 2025

- 2015 Initiative to promote Chinese manufacturing via trade barriers and subsidies.

National Trade Council

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- Proposed tariffs on goods imported from China to counter *"Made in China 2025"*.

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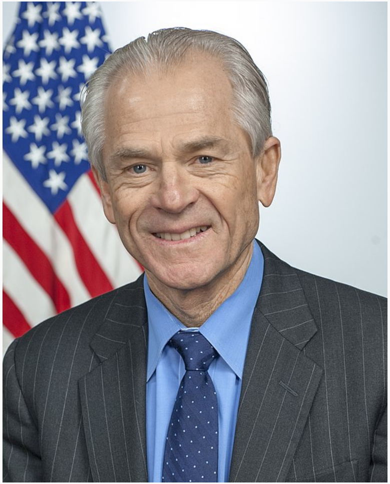

Renewed Interest in Old-but-Unresolved Policy Questions

These developments have resurfaced some old-but-unresolved policy questions:

1. is trade policy an effective tool for correcting inter-sectoral misallocation?
2. if not, should governments correct misallocation, *unilaterally*, with industrial subsidies to target industries?
3. or should they coordinate their industrial policies via deep trade agreements?

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This Paper: Roadmap

Step #1. characterize optimal trade and industrial policies in an important class of *multi-industry, multi-country* quantitative trade models where misallocation stems from scale economies or profit-generating markups

Step #2. estimate the structural parameters that govern the gains from trade and industrial policy in open economies

Step #3. leverage the estimated parameters and optimal policy formulas to measure the maximal gains from trade and industrial policy under various scenarios

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This Paper: Overview of Findings

1. *(2nd-best)* Import tariffs and export subsidies are ineffective at correcting sectoral misallocation, even when designed optimally.
   - This is due to an innate tension between allocative efficiency and the terms-of-trade in open economies

2. Unilateral adoption of targeted industrial policies is also ineffective, as it triggers *immiserizing growth* effects in most countries.

3. Internationally-coordinated industrial policies, however, deliver welfare gains that are more transformative that any unilateral policy intervention
   - a deep agreement may be necessary to address free-riding

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Theoretical Model

Overview of the Model

We adopt a generalized *multi-country, multi-industry* Krugman model:

- semi-parametric + general equilibrium
- tractably accommodates IO linkages
- accommodates the ToT-improving & misallocation-correcting cases for policy
- is isomorphic to a *Melitz-Pareto* model or an *Eaton-Kortum* model with Marshallian externalities (Kucheryavyy *et al.*, 2023).

The Economic Environment

- Many countries: $i, j, n = 1, ..., \mathcal{N}$
  - Country i is populated by L_i workers who supply labor inelastically.
  - Labor is the only (primary) factor of production
- Many industries: $k, g = 1, ..., \mathcal{K}$
  - Industries differ in terms of their trade elasticity, scale elasticity, *etc*.
  - Each industry is served by many firms (index ω)

Notation: Good's Indexes

– Goods are indexed by origin–destination–industry

$$\text{good } ij,k \;\sim\; \text{origin } i - \text{destination } j - \text{industry } k$$

– *Supply-side* variables are indexed by origin–industry

$$\text{subscript } i,k \;\sim\; \text{origin } i - \text{industry } k$$

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Preferences: Non-Parametric Across Industries

- Representative consumer's problem in country i

national income

$$\max_{\mathbf{Q}_i} \; U_i(\mathbf{Q}_i) \qquad s.t. \; \sum_k \left(\tilde{P}_{i,k} Q_{i,k}\right) = Y_i$$

  - $\mathbf{Q}_i \equiv \{Q_{i,k}\}$ ~ composite industry-level consumption.
  - $\tilde{\mathbf{P}}_i \equiv \{\tilde{P}_{i,k}\}$ ~ "consumer" price index of industry-level composite.

- The Marshallian demand function for *industry* k goods in *market* i

$$Q_{i,k} = \mathcal{D}_{i,k}(\tilde{\mathbf{P}}_i, Y_i)$$

- The **Cobb-Douglas** case: $U_i(\mathbf{Q}_i) = \prod_{k=1}^{\mathcal{K}} Q_{i,k}^{e_{i,k}} \longrightarrow Q_{i,k} = e_{i,k} Y_i / \tilde{P}_{i,k}$

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Preferences: Nested-CES within Industries

– Within-industry utility aggregator:

$$Q_{i,k} = \left(\sum_{j \in \mathbb{C}} Q_{ji,k}^{\frac{\sigma_k - 1}{\sigma_k}} \right)^{\frac{\sigma_k}{\sigma_k - 1}} \qquad Q_{ji,k} = \left(\sum_{\omega \in \Omega_{j,k}} q_{ji,k}(\omega)^{\frac{\gamma_k - 1}{\gamma_k}} \right)^{\frac{\gamma_k}{\gamma_k - 1}}$$

– Nested-CES demand demand function:

$$\underbrace{q_{ji,k}(\omega) = \left(\frac{\tilde{p}_{ji,k}(\omega)}{\tilde{P}_{ji,k}} \right)^{-\gamma_k} Q_{ji,k}}_{\text{firm-level demand}} \qquad \underbrace{Q_{ji,k} = \left(\frac{\tilde{P}_{ji,k}}{\tilde{P}_{i,k}} \right)^{-\sigma_k} \mathcal{D}_{i,k}\left(\tilde{\mathbf{P}}_i, Y_i \right)}_{\text{national-level demand}}$$

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Production and Firms

– Firms compete under monopolistic competition.

– variety-specific marginal cost (*origin* i*–destination* j*–industry* k)

$$c_{ij,k}(\omega) = \frac{\tau_{ij,k}\, w_i}{\varphi_{i,k}(\omega)}$$

– Entry is either free or restricted

  – **Free Entry:** endogenous number of firms + zero profits

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this presentation will focus on this case

Summarizing the Supply Side

- The *producer* price index of goods supplied by *origin i–industry k*:

$$P_{ij,k} = \text{constant} \times \left[\int_{\Omega_{i,k}} c_{ij,k}(\omega)^{1-\gamma_k}\, d\omega\right]^{\frac{1}{1-\gamma_k}} L_{i,k}^{-\frac{1}{\gamma_k - 1}}$$

- Following the literature, we refer to $\mu_k \sim \frac{1}{\gamma_k - 1}$ as the **scale elasticity**
  - special case w/ constant-returns to scale: $\mu_k \to 0$
  - $1 + \mu_k \sim \frac{\gamma_k}{\gamma_k - 1}$ also represents the constant firm-level *markup*

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The Rationales for Policy Intervention

Two rationales for policy intervention from country i's standpoint:

1. Correct inter-industry misallocation
   - high-returns-to-scale (high-μ) industries exhibit inefficiently low levels of output
2. Take advantage of unexploited terms of trade (ToT) benefits
   - **export side:** firm-level markups do not internalize country i's collective export market power $\longrightarrow$ use policy to elicit a higher markup
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Key Elasticities for Policy Evaluation in Open Economies

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- Lower $\sigma_k \longrightarrow$ more scope for ToT manipulation in industry k
- Higher $Var\left(\mu_k\right) \longrightarrow$ greater degree of misallocation in the economy

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Policy Instruments

- Governments are afforded a complete set of tax instruments $\longrightarrow$ they can target each policy margin and obtain the *first-best* outcome from a unilateral standpoint.
- Taxes/subsidies create a wedge b/w *producer prices* (P) and *consumer prices* ($\tilde{P}$):

$$\tilde{P}_{ij,k} = \frac{1 + t_{ij,k}}{\left(1 + x_{ij,k}\right)\left(1 + s_{i,k}\right)} P_{ij,k}$$

- Tax revenues are rebated to the consumers lump-sum.[1] Definition of equilibrium

[1] **Note:** lump-sum transfers are isomorphic to uniform consumption subsidies in the present setup because the labor supply is inelastic—see Dixit, 1980 and Lashkaripour, 2020.

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$$\tilde{P}_{ij,k} = \frac{1 + t_{ij,k}}{\left(1 + x_{ij,k}\right)\left(1 + s_{i,k}\right)} P_{ij,k}$$

export subsidy offered by country i

– Tax revenues are rebated to the consumers lump-sum.[1] Definition of equilibrium

[1] **Note:** lump-sum transfers are isomorphic to uniform consumption subsidies in the present setup because the labor supply is inelastic—see Dixit, 1980 and Lashkaripour, 2020.

Policy Instruments

– Governments are afforded a complete set of tax instruments $\longrightarrow$ they can target each policy margin and obtain the *first-best* outcome from a unilateral standpoint.

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Efficient Policy from a Global Standpoint

First-Best: Optimal Policy Problem with all Instruments

- The globally efficient policy solves the following planning problem *contingent on* the provision of lump-sum transfers:

$$\max_{\mathbf{t},\mathbf{x},\mathbf{s}} \quad \sum_{i\in\mathbb{C}} \left[\delta_i \log W_i\left(\mathbf{t},\mathbf{x},\mathbf{s};\mathbb{X}\right)\right] \qquad s.t. \text{ Equilbrium conditons.}$$

- The efficient policy features *zero trade taxes* and Pigouvian subsidies that restore marginal-cost-pricing globally:

$$t^{\star}_{ji,k} = x^{\star}_{ji,k} = 0 \qquad\qquad 1 + s^{\star}_{i,k} = 1 + \mu_k \quad (\forall i, k)$$

- As we will see, welfare-maximizing governments will deviate from the efficient policy to take advantage of terms-of-trade (ToT) gains.

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vector of equilibrium outcome

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Unilaterally Optimal Policy Choices

First-Best: Optimal Policy Problem with all Instruments

– Country i's unilaterally optimal policy problem

import tariff

vector of equilibrium outcome

$$\max_{\mathbf{t}_i,\mathbf{x}_i,\mathbf{s}_i} W_i\left(\mathbf{t}_i, \mathbf{x}_i, \mathbf{s}_i; \mathbb{X}\right) \qquad s.t. \text{ Equilbrium conditons}$$

export subsidy

industrial subsidy

– **Note:** the solution to the above problem does *not* internalize country i's ToT externality on the rest of the world $\longrightarrow$ it's sub-optimal from a global standpoint.

Dual approach for deriving 1st-best policies

First-Best: Optimal Policy Problem with all Instruments

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Dual approach for deriving 1st-best policies

Theorem 1: First-Best Unilaterally Optimal Policy

[industrial subsidy] $$1 + s^*_{i,k} = (1 + \mu_k)(1 + \bar{s}_i)$$

[import tariff] $$1 + t^*_{ji,k} = \left(1 + \omega_{ji,k}\right)(1 + \bar{t}_i)$$

[export subsidy] $$1 + x^*_{ij,k} = \frac{(\sigma_k - 1)\sum_{n\neq i}\left[\left(1 + \omega_{ni,k}\right)\lambda_{nj,k}\right]}{1 + (\sigma_k - 1)\left(1 - \lambda_{ij,k}\right)}(1 + \bar{t}_i)$$

Theorem 1: First-Best Unilaterally Optimal Policy

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arbitrary tax shifters to account for multiplicity

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restores marginal cost-pricing

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good ij,k's (inverse) supply elasticity

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can be characterized in terms of σ_k, μ_k, and observable shares

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expenditure share on good ij, k

Special Case: Multi-Industry Armington Model

Theorem 1 describes optimal policy in the multi-industry ***Armington*** or ***Eaton-Kortum*** models, as a special case with constant-returns to scale industries ($\mu_k = 0$):

$$\text{[industrial subsidy]} \qquad s^*_{i,k} = 0$$

$$\text{[import tariff]} \qquad 1 + t^*_{ji,k} = 1 + \bar{t}_i$$

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Special Case: Small Open Economy

Suppose country i is a small open economy ($\omega_{ji,k} \approx \lambda_{ij,k} \approx 0$) $\longrightarrow$ our optimal policy formulas reduce to:

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A Verbal Summary of Theorem 1

The unilaterally optimal (first-best) policy consists of

1. industrial subsidies ($\mathbf{s}_i$) that promote high-μ (*high-returns-to-scale*) industries.

2. import tariffs ($\mathbf{t}_i$) $+$ export subsidies ($\mathbf{x}_i$) that contract exports in low-σ industries.

Corollary: first-best optimal tariffs and export subsidies are *misallocation-blind*.

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Second-Best: Optimal Policy with Limited Policy Instruments

- Country i's 2nd-best optimal trade policy problem

$$\max_{\mathbf{t}_i,\mathbf{x}_i,\mathbf{s}_i} W_i\left(\underbrace{\mathbf{t}_i}_{\text{import tariff}}, \underbrace{\mathbf{x}_i}_{\text{export subsidy}}, \underbrace{\mathbf{s}_i}_{\text{industrial subsidy}}; \mathbb{X}\right) \qquad s.t. \begin{cases} \text{Equilbrium conditons} \\ \mathbf{s}_i = \mathbf{0} \end{cases}$$

- **Note:** The restriction that $\mathbf{s}_i = \mathbf{0}$ may reflect institutional barriers or political economy pressures.

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Theorem 2: Second-Best Import Tariffs and Export Subsides

$$1 + t_{ji,k}^{**} = \frac{1 + (\sigma_k - 1)\,\lambda_{ii,k}}{1 + \frac{1+\overline{\mu}_i}{1+\mu_k}(\sigma_k - 1)\,\lambda_{ii,k}} \left(1 + t_{ji,k}^{*}\right)$$

$$1 + x_{ij,k}^{**} = \frac{1 + \mu_k}{1 + \overline{\mu}_i} \left(1 + x_{ij,k}^{*}\right)$$

– **Intuition:** *2nd-best* import tariff & export subsidies try to mimic the *1st-best* Pigouvian subsidies, but are unable to this effectively as we see next!

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average μ_k in economy i

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promote exports in high-μ industries

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The Efficacy of Trade and Industrial Policy

Tension between ToT and Allocative Efficiency

- Improving allocative efficiency necessitates directing resources toward high-returns-to-scale (high-μ) industries.
- ToT improvement requires contracting exports (an thus output) (low-σ) industries, where import demand is less-elastic.

Conjecture 1

- If $Cov\left(\sigma_k, \mu_k\right) < 0 \longrightarrow$ standalone trade policy has difficulty striking a balance between ToT & misallocation-correcting objectives
- 2nd-best trade policy measures are, thus, ineffective, even when set optimally.

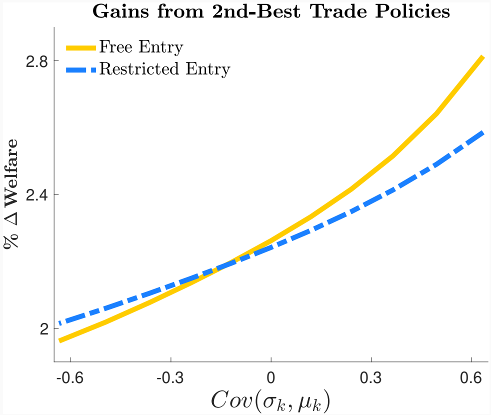
Tension between ToT and Allocative Efficiency

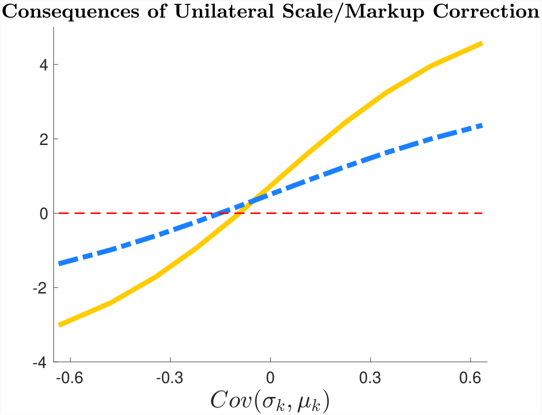
- Improving allocative efficiency necessitates directing resources toward high-returns-to-scale (high-μ) industries.
- ToT improvement requires contracting exports (an thus output) (low-σ) industries, where import demand is less-elastic.

Conjecture 2

- If $Cov\left(\sigma_k, \mu_k\right) < 0 \longrightarrow$ unilateral scale correction via industrial policy can worsen national welfare through adverse ToT effects
- These adverse consequences resemble the ***immiserizing growth paradox***

Tension between ToT and Misallocation-Correcting Objectives





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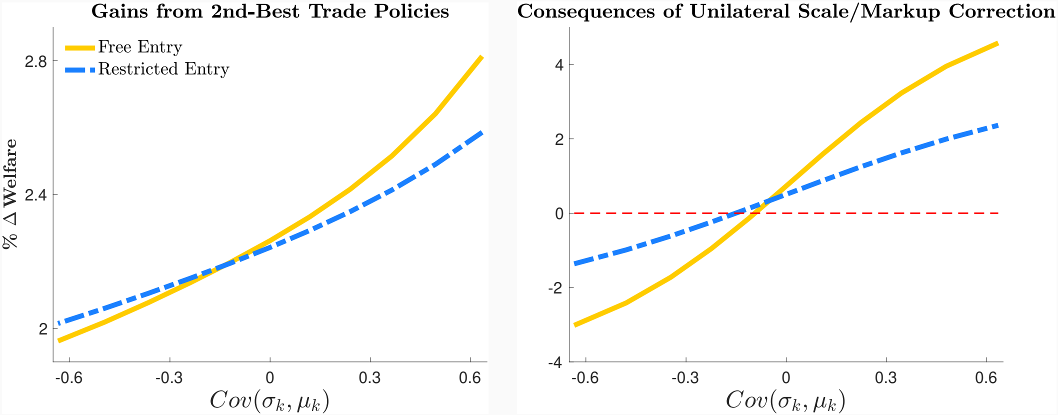

The Case for Industrial Policy Coordination

		Country j ($\%\Delta W_j$)	
		$\mathbf{s}_j = \mathbf{0}$	$\mathbf{s}_j = \boldsymbol{\mu}$
Country i ($\%\Delta W_i$)	$\mathbf{s}_i = \mathbf{0}$	(0% , 0%)	(3.7% , −1.2%)
	$\mathbf{s}_i = \boldsymbol{\mu}$	(−1.2% , 3.7%)	(2.7% , 2.7%)

– If countries restrict themselves to efficient industrial policy choices, they my avoid implementation to escape immiserizing growth effects $\longrightarrow$ race to the bottom

– industrial policy coordination via a deep agreement can address this problem

The Case for Industrial Policy Coordination

Nash outcome

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Country i ($\%\Delta W_i$)	$\mathbf{s}_i = \mathbf{0}$	$\boxed{(\ 0\%\ ,\ 0\%\ )}$ Nash outcome	$(\ 3.7\%\ ,\ -1.2\%\ )$
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Estimating the Key Policy Parameters

The Parameters Governing the Gains from Policy

- The gains from optimal policy depend crucially on two sets of elasticities:[2]

  1. **industry-level scale elasticity** (μ_k)
  2. **industry-level trade elasticity** $(\sigma_k - 1)$

- The past literature often uses ad-hoc normalizations to recover μ_k:

  - perfectly competitive models $\longrightarrow$ $\mu_k = 0$
  - traditional Krugman/Melitz models $\longrightarrow$ $\mu_k = \frac{1}{\text{trade elasticity}}$

[2] **Note:** To account for firm-selection à la *Melitz-Chaney*, we need to estimate the shape of the Pareto distribution in addition to σ_k and $\mu_k = 1/(\gamma_k - 1)$.

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  2. **industry-level trade elasticity** $(\sigma_k - 1)$

- The past literature often uses ad-hoc normalizations to recover μ_k:

  - perfectly competitive models $\longrightarrow$ $\mu_k = 0$
  - traditional Krugman/Melitz models $\longrightarrow$ $\mu_k = \frac{1}{\text{trade elasticity}}$

[2]**Note:** To account for firm-selection à la *Melitz-Chaney*, we need to estimate the shape of the Pareto distribution in addition to σ_k and $\mu_k = 1/(\gamma_k - 1)$.

Overview of Estimation Strategy

- We jointly estimate μ_k and σ_k to obtain credible estimates for $Cov(\mu_k, \sigma_k)$
- **Estimating equation :** *firm-level* nested-CES demand function (t indexes year)

$$\ln \tilde{x}_{ji,kt}(\omega) = -(\sigma_k - 1)\ln \tilde{p}_{ji,kt}(\omega) + \left[1 - \frac{\sigma_k - 1}{\gamma_k - 1}\right]\ln \lambda_{ji,kt}(\omega) + D_{i,kt} + \varepsilon_{\omega jikt}$$

firm-leve sales ($\tilde{x} = \tilde{p}q$)

firm-level price

within-national market share

- **Data source:** Universe of Colombian import transactions during 2007-2013, covering 226,288 exporting firms from 251 different countries.
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Estimation Results

Sector	ISIC code	Estimated Parameter: trade elasticity $\sigma_k - 1$	scale elast. × trade elast. $\mu_k \times (\sigma_k - 1)$	scale elasticity μ_k	Obs.	Weak Ident. Test
Agriculture & Mining	100-1499	6.227	0.891	0.143	11,568	2.40
		(2.345)	(0.148)	(0.059)		
Food	1500-1699	2.303	0.905	0.393	19,615	6.27
		(0.765)	(0.046)	(0.132)		
Textiles, Leather, & Footwear	1700-1999	3.359	0.753	0.224	125,120	66.65
		(0.353)	(0.022)	(0.024)		
Wood	2000-2099	3.896	0.891	0.229	5,872	1.41
		(1.855)	(0.195)	(0.120)		
Paper	2100-2299	2.646	0.848	0.320	37,376	3.23
		(1.106)	(0.061)	(0.136)		
Petroleum	2300-2399	0.636	0.776	1.220	3,973	2.83
		(0.464)	(0.119)	(0.909)		
Chemicals	2400-2499	3.966	0.921	0.232	133,142	38.01
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		(1.176)	(0.062)	(0.034)		
Minerals	2600-2699	5.283	0.881	0.167	27,952	3.53
		(1.667)	(0.108)	(0.056)		
Basic & Fabricated Metals	2700-2899	3.004	0.627	0.209	153,102	20.39
		(0.484)	(0.030)	(0.035)		
Machinery & Equipment	2900-3099	7.750	0.927	0.120	263,797	12.01
		(1.330)	(0.072)	(0.023)		
Electrical & Optical Equipment	3100-3399	1.235	0.682	0.552	257,775	26.27
		(0.323)	(0.017)	(0.145)		
Transport Equipment	3400-3599	2.805	0.363	0.129	85,920	5.50
		(0.834)	(0.036)	(0.041)		
N.E.C. & Recycling	3600-3800	6.169	0.938	0.152	70,264	11.57
		(1.012)	(0.090)	(0.029)		

Summary of Estimated Scale Elasticities

High returns to scale sectors

1. Electrical & Optical Equipment
2. Petroleum
3. Paper

Low returns to scale sectors

1. Agriculture & Mining
2. Wood
3. Machinery Equipment

– When using our estimated scale elasticities, researchers must ensure to retain the covariance between scale & trade elasticities, $Cov(\mu_k, \sigma_k)$, by either:

1. using our estimated scale elasticities (μ_k) in conjunction with our estimated trade elasticities ($\sigma_k - 1$), which implies $Cov(\mu_k, \sigma_k) \approx -0.65$
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Quantifying the Gains from Policy

Sketch of Quantitative Strategy

- Compute the counterfactual equilibrium under optimal policy:
  - (1) equilibrium allocation depends on optimal policy
  - (2) optimal policy depends on equilibrium allocation
  - jointly solve the systems of equations implied by (1) and (2).

- Sufficient statistics for counterfactual policy analysis

$$\mathcal{B}_v \equiv \{\lambda_{ni,k}, e_{n,k}, r_{ni,k}, \rho_{i,k}, w_n \bar{L}_n, Y_n\}_{ni,k} \qquad \mathcal{B}_e = \{\sigma_k - 1, \mu_k\}_k$$

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expenditure share

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sales share

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national accounts data

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estimable parameters

Data Sources

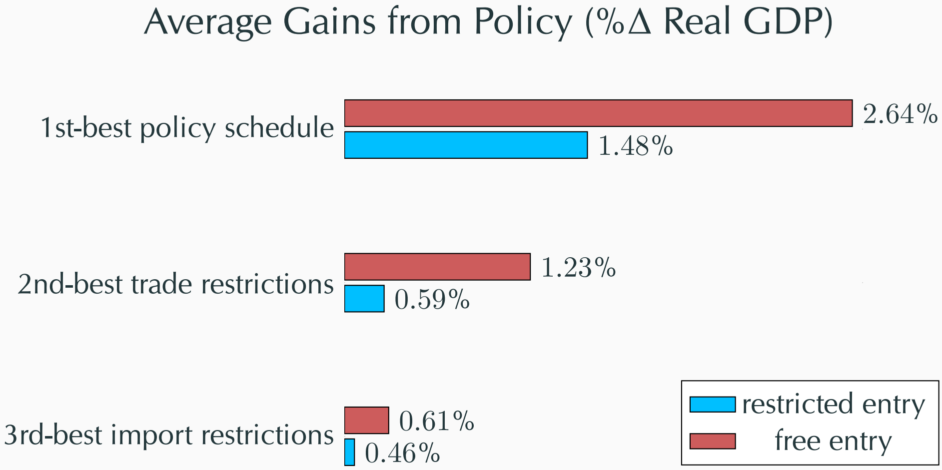
World Input-Output Database (2000-2014)

- production and expenditure by *origin×destination×industry*.
- 44 Countries + an aggregate of the rest of the world
- 56 Industries

Unctad-Trains Database:

- average industry-level tariffs for all *44×43* country pairs.

The Gains from Unilaterally Optimal Policies (w/o retaliation)



Accounting for firm-selection

σ_k and μ_k estimated in levels

The Immiserizing Growth Effects of Unilateral Industrial Policy

Welfare consequences of *corrective* industrial subsidies under **free entry**

- Unilateral adoption $\longrightarrow$ **0.70%** decline in real GDP
- Coordinated via a deep agreement $\longrightarrow$ **3.22%** rise in real GDP

Welfare consequences of *corrective* industrial subsidies under **restricted entry**

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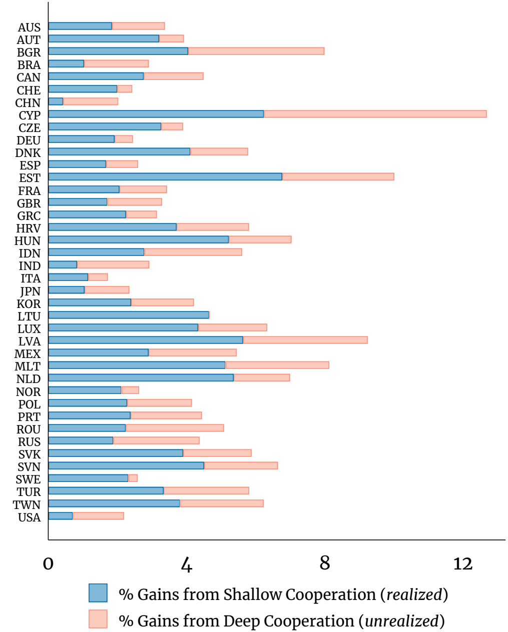
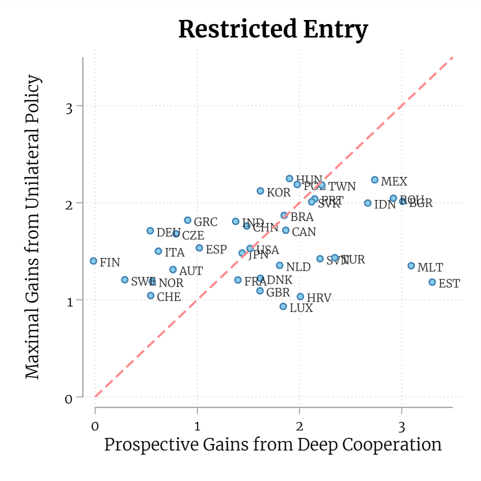
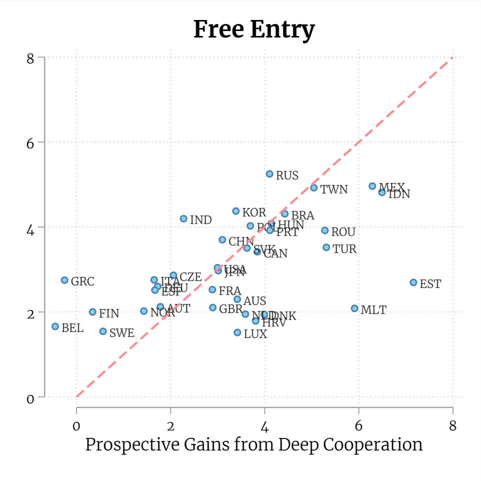
The Prospective Gains from Deep Cooperation



A Stronger Case for International Cooperation?





Conclusions

- Import tariffs and export subsidies are an ineffective *second-best* measure for correcting sectoral misallocation due to scale economies
- *Unilateral* adoption of *first-best* industrial policies is also ineffective, as it leads to *immiserizing growth* effects in most countries.
- Industrial policies coordinated internationally via a *deep* agreement are more transformative than any unilateral policy intervention.

Thank you

References

Equilibrium for a given Vector of Taxes, $\mathbb{T} = (\mathbf{t}, \mathbf{x}, \mathbf{s})$

1. Consumption choices are optimal: $\begin{cases} Q_{ji,k} = \mathcal{D}_{ji,k}(Y_i, \tilde{\mathbf{P}}_i) \\ \tilde{P}_{ji,k} = \frac{1+t_{ji,k}}{(1+x_{ji,k})(1+s_{j,k})} P_{ji,k} \end{cases}$

2. Production choices are optimal: $P_{ij,k} = constant_{ij} \times w_i \left(\sum_n \tau_{in,k} Q_{in,k}\right)^{-\frac{\mu_k}{1+\mu_k}}$

3. Wage payments equal net sales: $w_i L_i = \sum_{j=1}^{N} \sum_{k=1}^{K} \left[P_{ij,k} Q_{ij,k}\right]$

4. Income equals wage payments plus tax revenues: $Y_i = w_i L_i + \mathcal{R}_i(\mathbf{t}, \mathbf{x}, \mathbf{s})$

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Our Dual Approach to Characterizing $\mathbb{T}^\star$

Step 1–Reformulate the optimal policy problem

- The government in i chooses optimal consumer prices and abatement levels

$$\max_{\mathbb{T}_i} \; W_i(\mathbb{T}_i; \mathbb{X}_i) \quad [\mathbf{P1}] \quad \xrightarrow{\text{reformulate}} \quad \max_{\mathbb{P}_i} \; W_i(\mathbb{P}_i; \mathbb{X}_i) \quad [\mathbf{P1'}]$$

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- This step is complicated by GE considerations $\longrightarrow$ traditional theories bypass these complications by focusing on partial equilibrium 2-by-2 models.
- Intermediate Envelope Theorem: The first-order conditions associated with Problem P1′ can be derived ***as if***

1. wages $\mathbf{w} = \{w_i\}$ are constant → GE wage effects are *welfare-neutral*
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Step 3–Solve the system of F.O.C.s

- We use the primitive properties of Marshallian demand (i.e., *Cournot aggregation*, *homogeneity of degree zero*) to prove that the system of F.O.C.s admits a unique and trivial solution.

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Identification Strategy

Take first differences to eliminate the firm-product FE

$$\ln \tilde{x}_{j,kt}(\omega) = -(\sigma_k - 1)\,\Delta \ln \tilde{p}_{j,kt}(\omega) + (1 - \mu_k[\sigma_k - 1])\,\Delta \ln \lambda_{j,kt}(\omega) + D_{kt} + \Delta\varepsilon_{\omega jkt}$$

- **Identification Challenge:** $\Delta \ln p$ (and $\Delta \ln \lambda$) maybe correlated with $\Delta\varepsilon$.

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Shift-Share Instrument

– Compile an external database on monthly exchange rates.

– Interact the change in monthly exchange rates w/ *prior* monthly export shares to construct a *variety-specific* shift-share IV:

$$z_{j,kt}(\omega) = \sum_{m=1}^{12} [\text{share of month } m \text{ exports}]_{t-1} \times [\text{YoY change in month } m \text{ exchange rate}]_t$$

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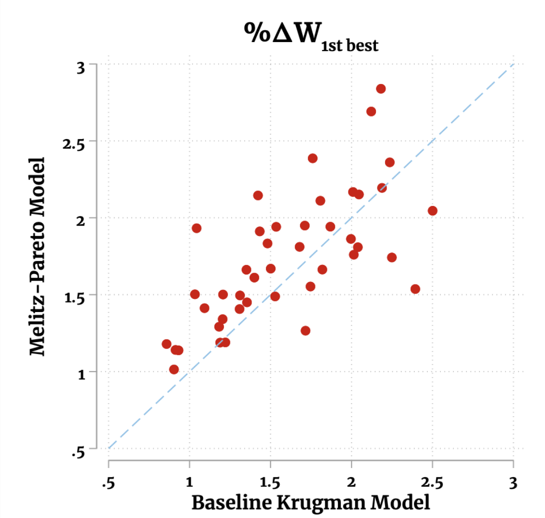
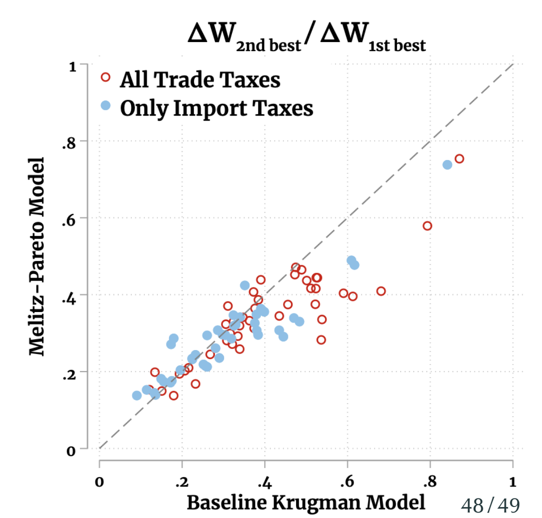
Accounting for Firm-Selection à la Melitz-Chaney

Return





Gains Implied by σ_k and μ_k Estimated in Levels

Return