Inequality, Redistribution, and Optimal Trade Policy: A Public Finance Approach

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Unequal Gains from Trade

- Gains from globalization are unequally distributed
  - ⋆ Often benefits productive workers and firms
- China shock: import competition from China
  - ⋆ Quarter of decline in US manufacturing during 1990-2007: Autor, Dorn, and Hanson (2013)
- Possible cause: large relocation costs and low elasticity of sectoral/ location choice:
  - ⋆ Artuc, Chaudhuri, McLaren (2010)

Redistributing Gains from Trade

- **Second Welfare Theorem Logic:** Aggregate gains from trade are positive; redistribute them using lump-sum taxes and transfers
- **Public Finance:** Lump-sum taxes are unavailable/unrealistic
  - What policy instruments to use? What margins to distort?
- If lump-sum taxes are unavailable: trade policy cannot be separated from fiscal policy
- How should we design optimal tax/trade policy to balance:
  - Efficiency gains from trade
  - Costs associated with increased inequality

What We Do

- General and tractable competitive model of trade
  - Input-Output linkages in production
  - Imperfect worker mobility
  - Government policy:
    - Direct taxes: Income taxes
    - Indirect taxes: Taxes on consumption and production
- Study the optimal cooperative tax system across countries
  - Abstract from strategic interactions
- Key friction:
  - Income taxes **cannot** depend on workers' characteristics and sector

What We Find

- Production must be taxed differently across sectors
- Its determinants:
  - Only income and employment distribution as well as labor supply elasticities in each country
- VAT taxes are optimal
- Quantitative implication: explore how taxes must react to China shock

Related Literature

- **Optimal commodity/intermediate good taxation:** Diamond and Mirrlees (1971), Atkinson and Stiglitz (1976), Deaton (1980), Naito (1999)
- **Optimal taxation in trade/spatial models:** Dixit and Norman (1986), Costinot and Werning (2018), Lyon and Waugh (2017), Fajgelbaum and Gaubert (2018), Ales and Sleet (2018)
- **Optimal non-cooperative trade policy:** Bagwell and Staiger (1999), Costinot, Donaldson, Vogel, and Werning (2015), Beshkar and Lashkaripour (2017)
- **Interplay between distortions and production networks:** Caliendo, Parro and Tsivinsky (2017), Baqaee and Farhi (2017)

Simple Model

NO LABOR MOBILITY

Production

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Intermediate Inputs

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- Preferences:

$$v = U^c(\mathbf{x}) - v^c(\ell)$$

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Assumption. Workers preferences satisfy

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  - More general results in the paper

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  - ⋆ Trade agreement; efficient negotiation

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  - At the optimum: G.E. welfare effect cancels G.E. revenue effect

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  - ⋆ $\overline{\mathcal{W}}_j^c$ depends on inequality within and across sectors

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- Alternative way of implementing: sector-specific payroll taxes

Model with Mobility

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$$L_j^c = \int_\Theta \int_{\mathbb{R}^N} a_j^c(\theta)\eta_j \ell_j(\theta,\eta) \mathbf{1}\left[w_j^c a_j^c(\theta)\eta_j \geq w_{j'}^c a_{j'}^c(\theta)\eta_{j'}\right] dH(\boldsymbol{\eta})\mu^c(\theta)d\theta$$

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  - ⋆ $\sigma > 1 + \varepsilon^c$ to ensure integrals exist

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  - ⋆ Fraction of workers of type θ in sector j

$$\Lambda_j^c(\theta) = \frac{\left(w_j^c a_j^c(\theta) \right)^\sigma}{\sum_i \left(w_i^c a_i^c(\theta) \right)^\sigma}$$

Optimal Taxes

Optimal Producer Taxes

$$(\sigma - 1)\frac{t_j^{p,c}}{1 - t_j^{p,c}} = 1 - \overline{\mathcal{W}}_j^c + (\sigma - 1 - \varepsilon^c)\left[\sum_i \frac{\int \Lambda_i \Lambda_j \bar{z} \mu^c d\theta}{(1 - t_i^{p,c}) \int \Lambda_j \bar{z} \mu^c d\theta} - 1\right]$$

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Relocation effect

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$$\frac{\overline{z}^c(\theta)}{\overline{z}^c(\theta')} = \left(\frac{\beta^c(\theta)}{\beta^c(\theta')}\right)^{1+\varepsilon^c}$$

Summary of Theory

- Optimal VAT producer taxes can be used to redistribute gains from trade across sectors
- Taxes are fully determined by employment and income distribution
- Optimal taxes depend on the specialization in the labor force
  - Absent specialization

QUANTITATIVE EXERCISE

Quantitative Model

- Main Question: How should a trade agreement involving U.S. and China be designed? What should be the VAT taxes?
- Closely follow Galle, Rodriguez-Clare, Yi (2017) and Caliendo, Dvorkin, Parro (2017)
- Two layers of production: final and intermediate goods
  - Intermediate goods: using labor and final goods; tradable
  - Final goods are produced with intermediate goods; non-tradable
  - Production of intermediate goods: Eaton and Kortum (2002)

Quantitative Model: Details

Calibration

- Key assumption: data comes from Laissez-Faire version of the model; in line with trade literature
- Parameters chosen independently

Parameter	Description	Values
ε^c	Frisch elasticity of hours	0.5
ν	Trade elasticity	4
σ	Elasticity of Labor Mobility	2
γ	Elasticity of substitution (preferences)	1

Calibration

- Parameters of production functions
  - ⋆ Use WIOT to determine expenditure, factor shares
- Trade costs:
  - ⋆ Price data from Groningen Growth and Development Center
  - ⋆ trade shares from WIOT
- Sectoral productivity
  - ⋆ Use price and bilateral trade share data

Trade Costs and TFP

Calibration

- Following Galle, Rodriguez-Clare and Yi (2017), each type is an education/location in the U.S.
  - Education: No-college vs. some college
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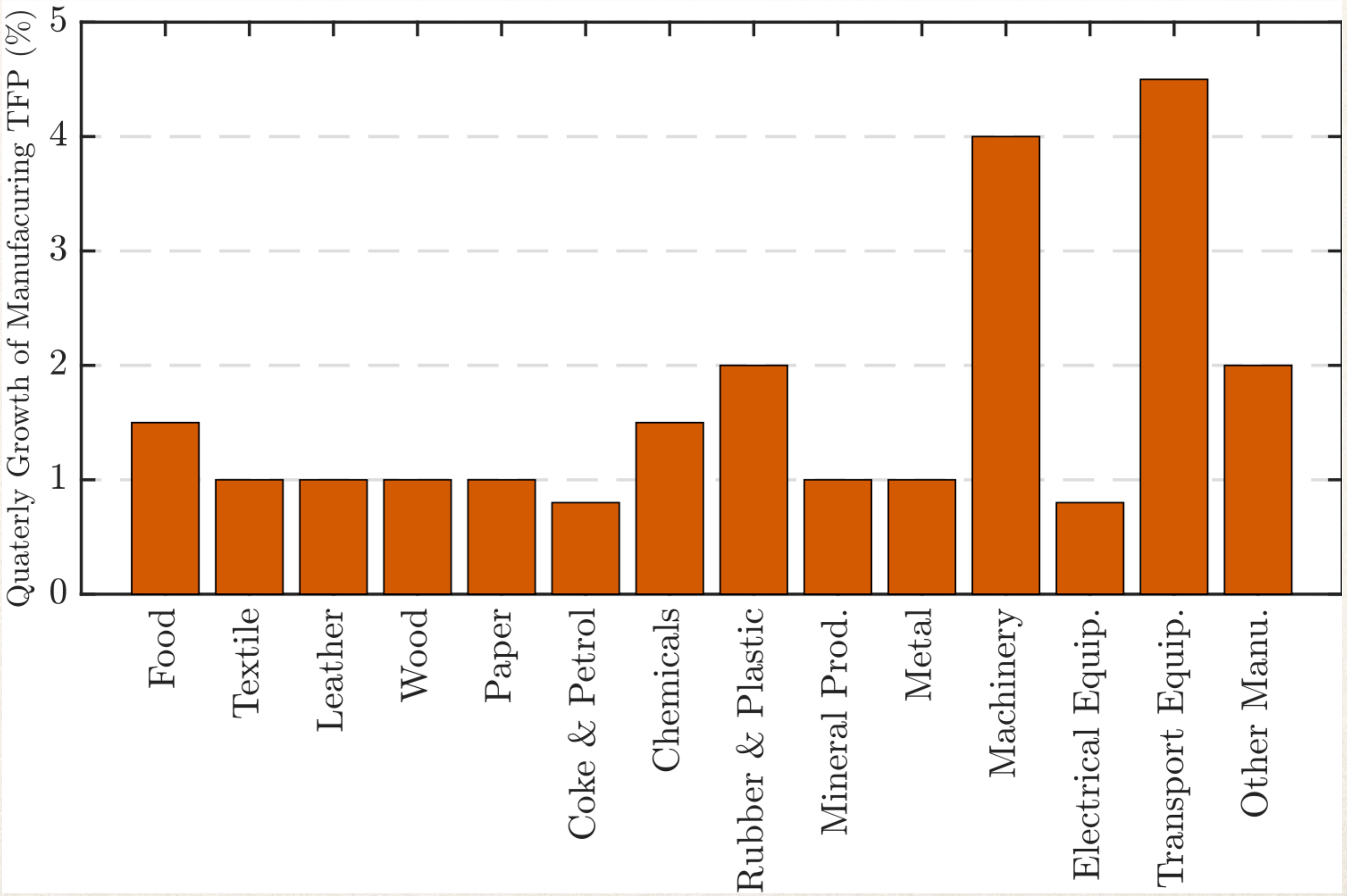
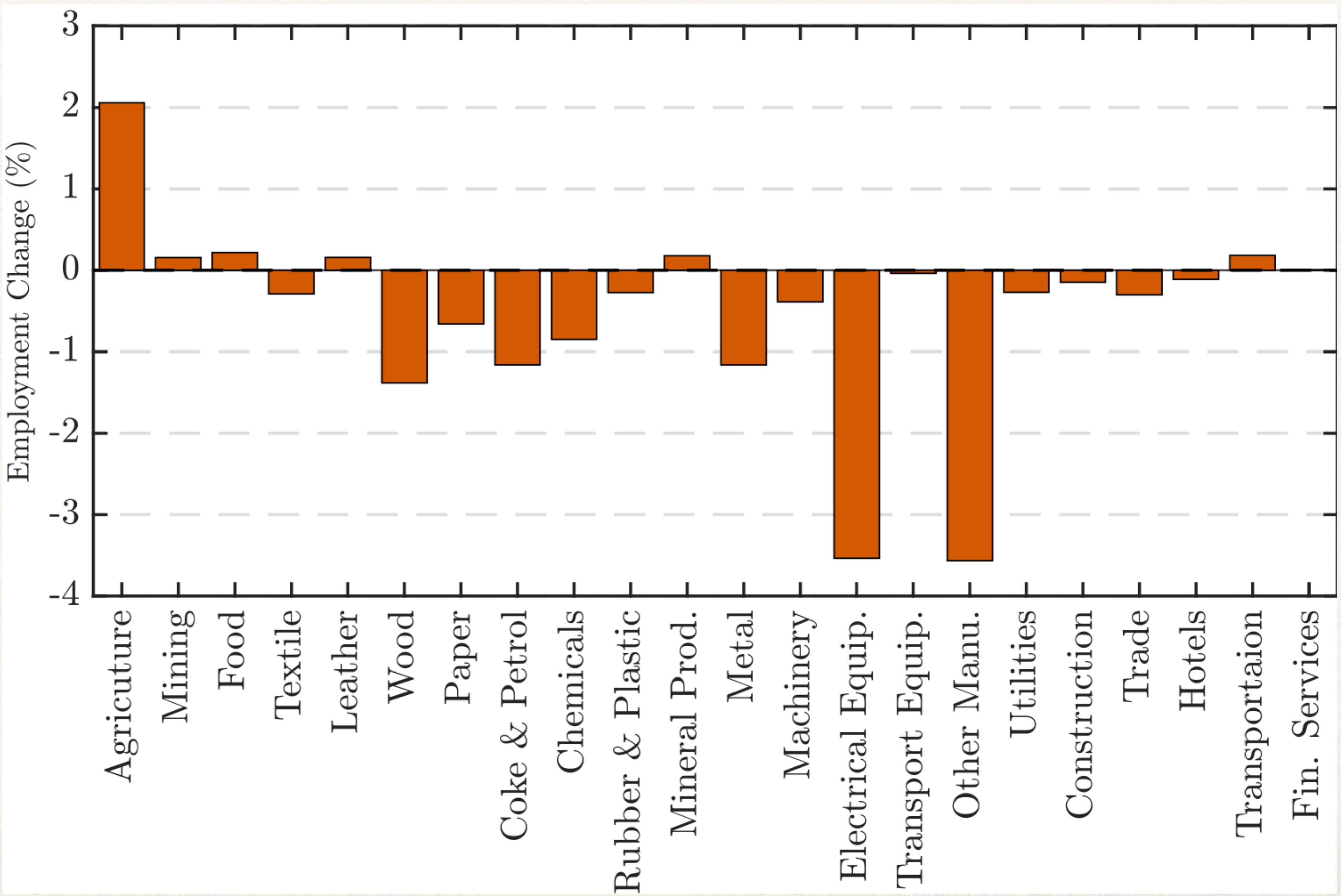
China Shock

- Model China shock as an increase in TFP in China - estimated by Caliendo, Dvorkin, Parro (2017); time horizon 2000-2007



China Shock: Employment Change



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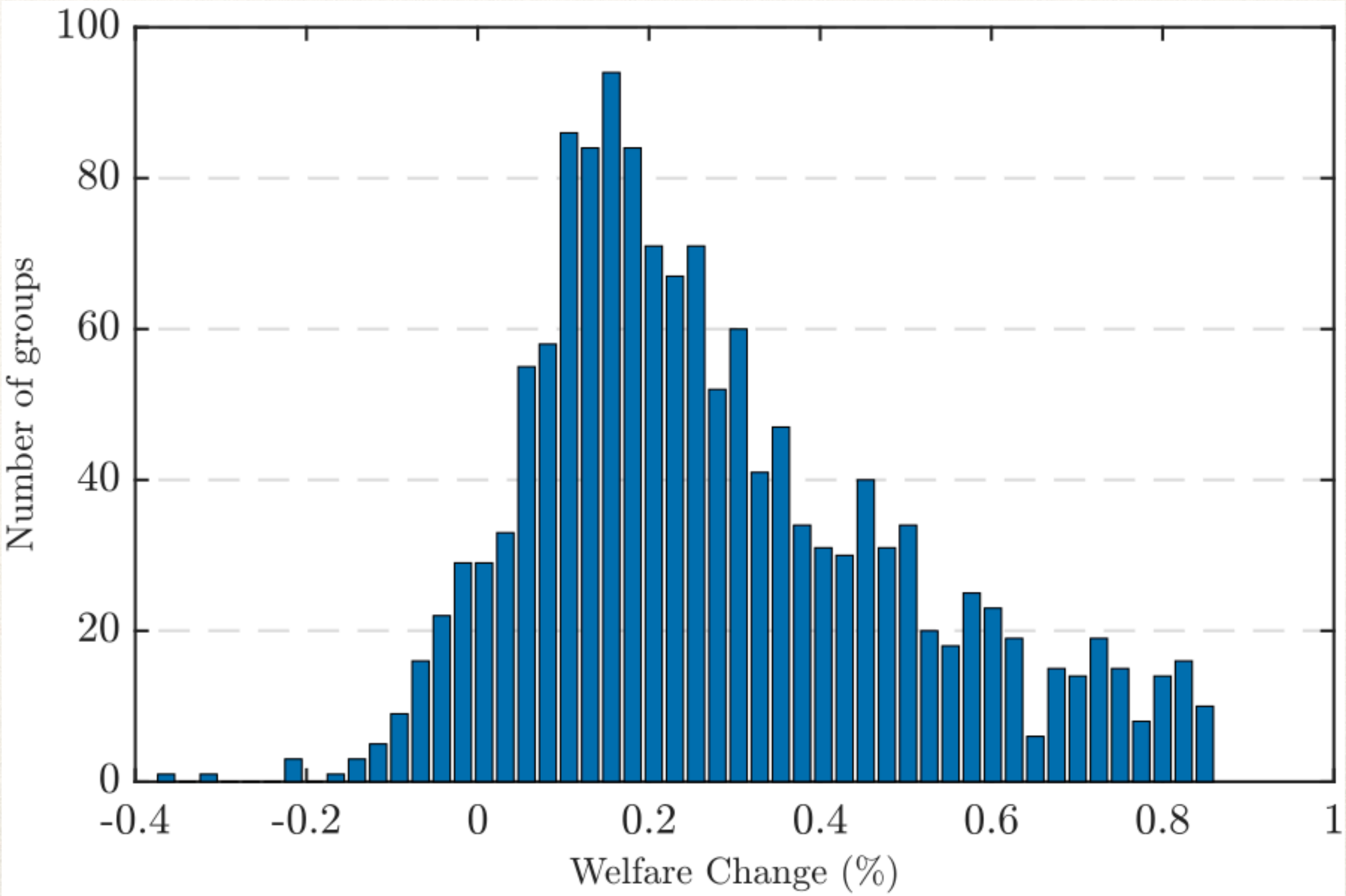

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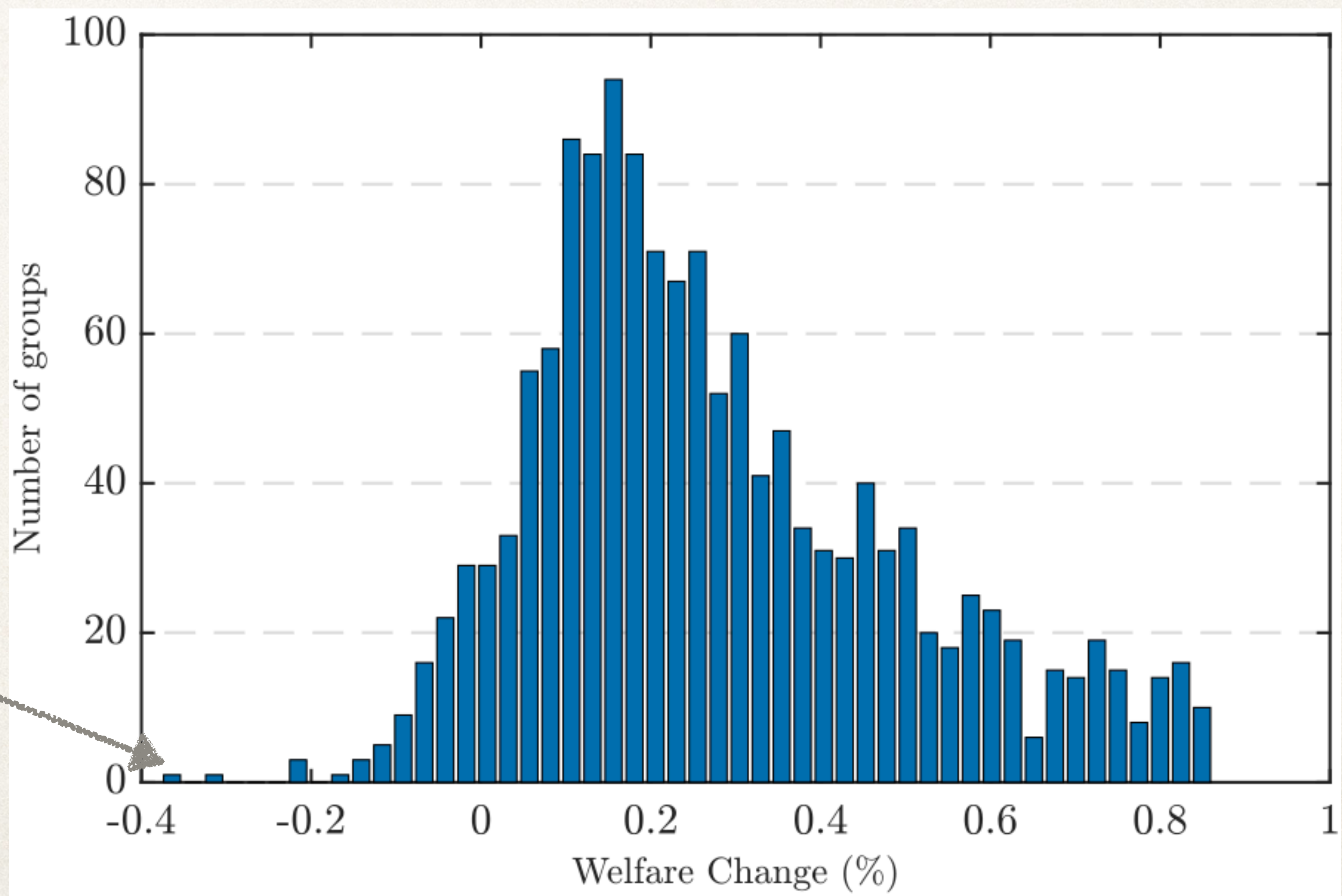
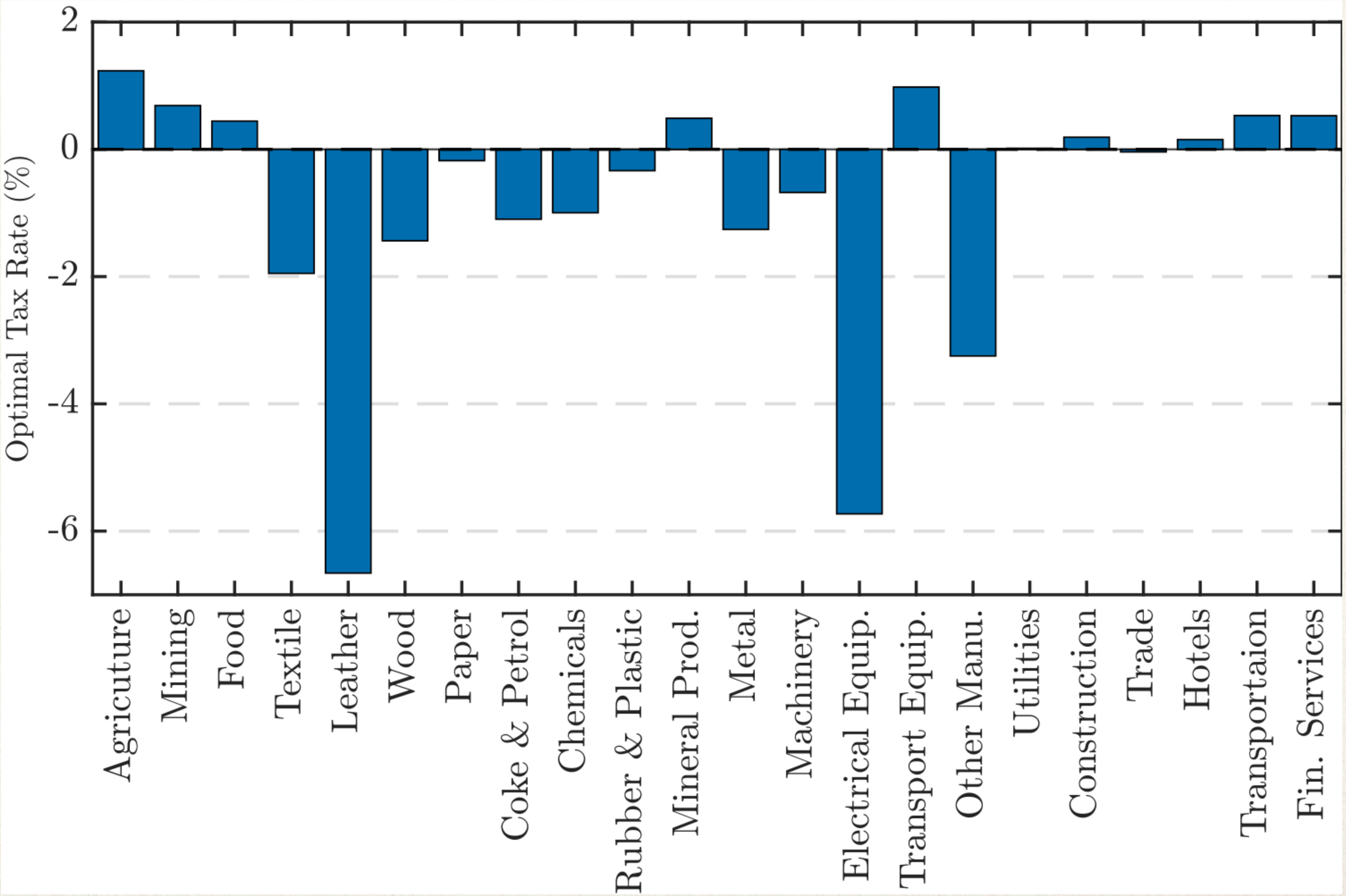
Skilled in
Monterey, CA



Optimal Policy Exercise

- Assume post China shock technology
- Maximize weighted average of welfare in other countries subject to delivering at least pre-shock welfare to all types in the U.S.
  - Tax reform that is Pareto improving
- Notice: Laissez-Faire is efficient
  - Pareto optimal taxation: without the China shock do nothing

Optimal Taxes



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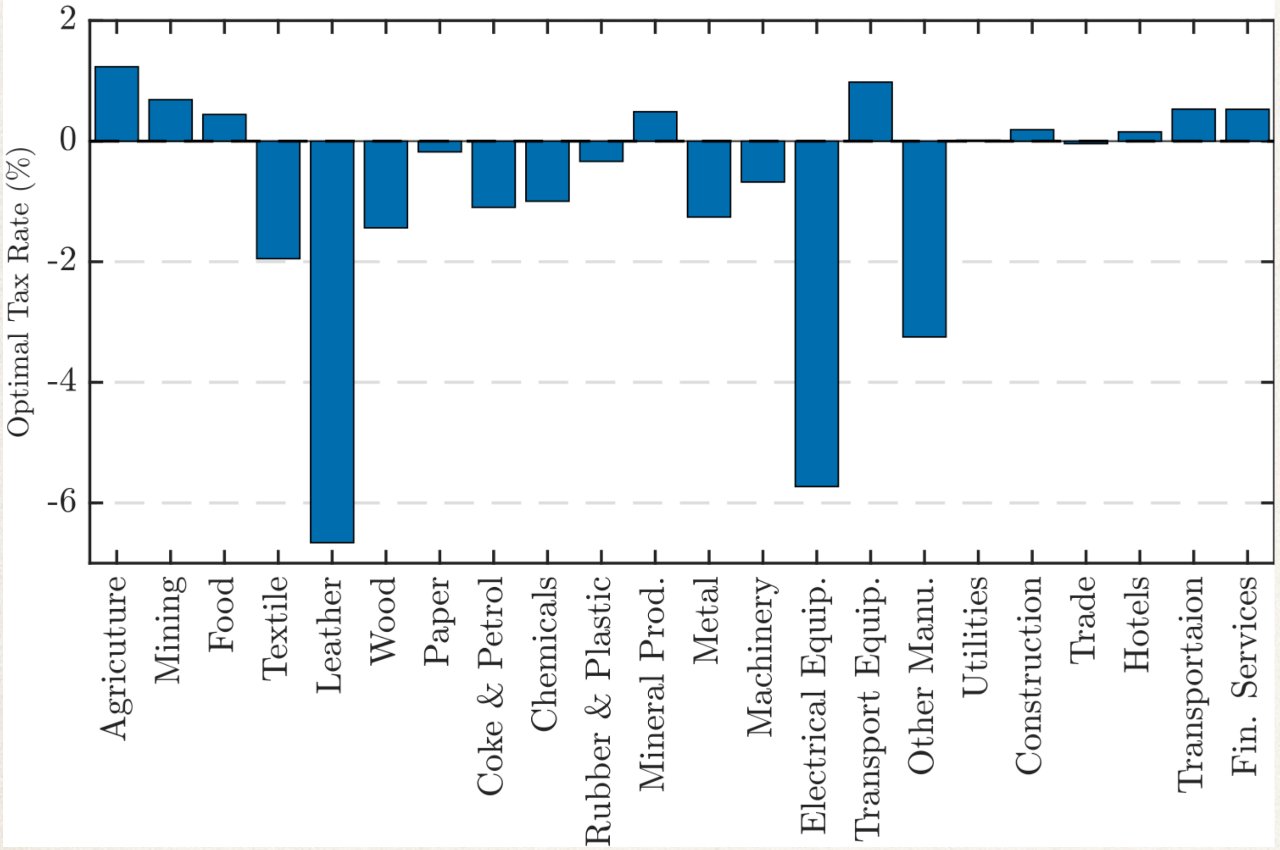

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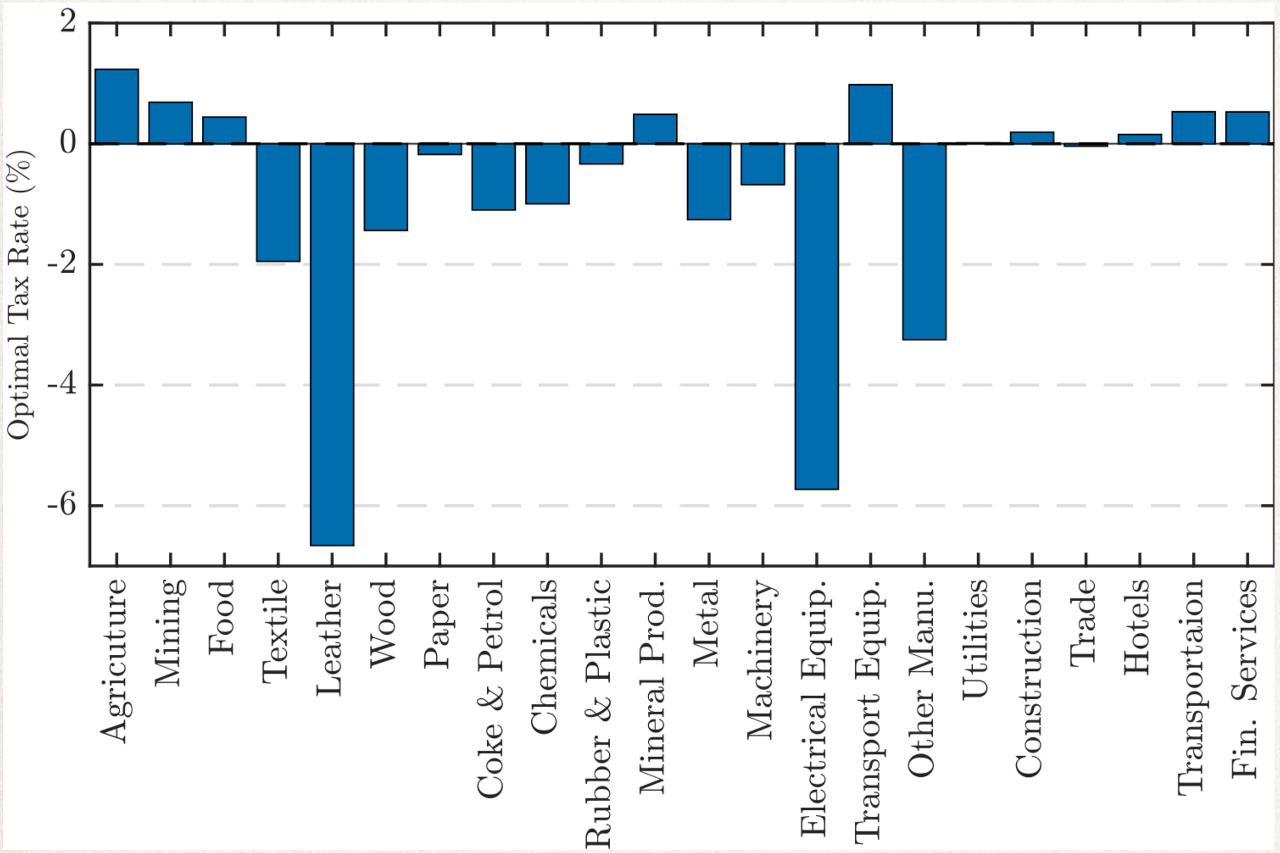
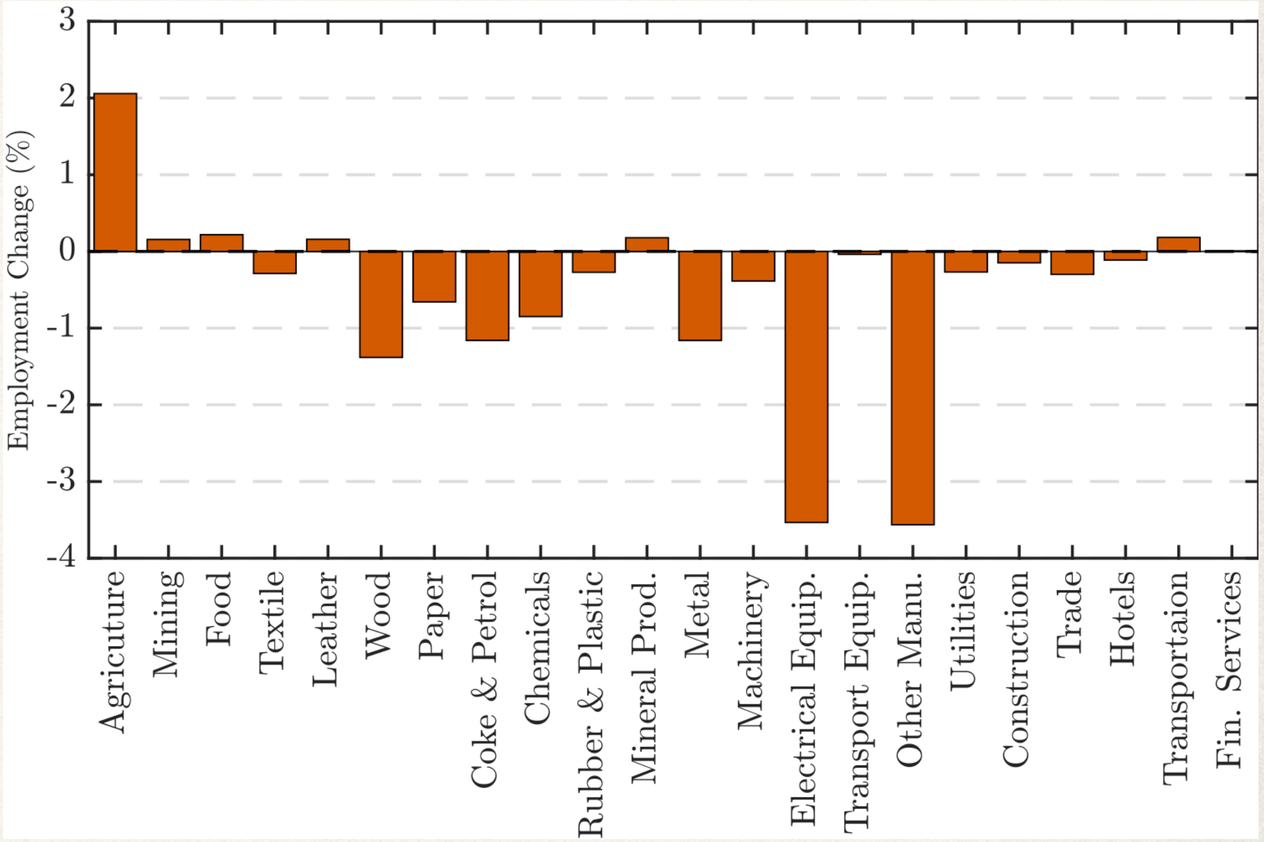
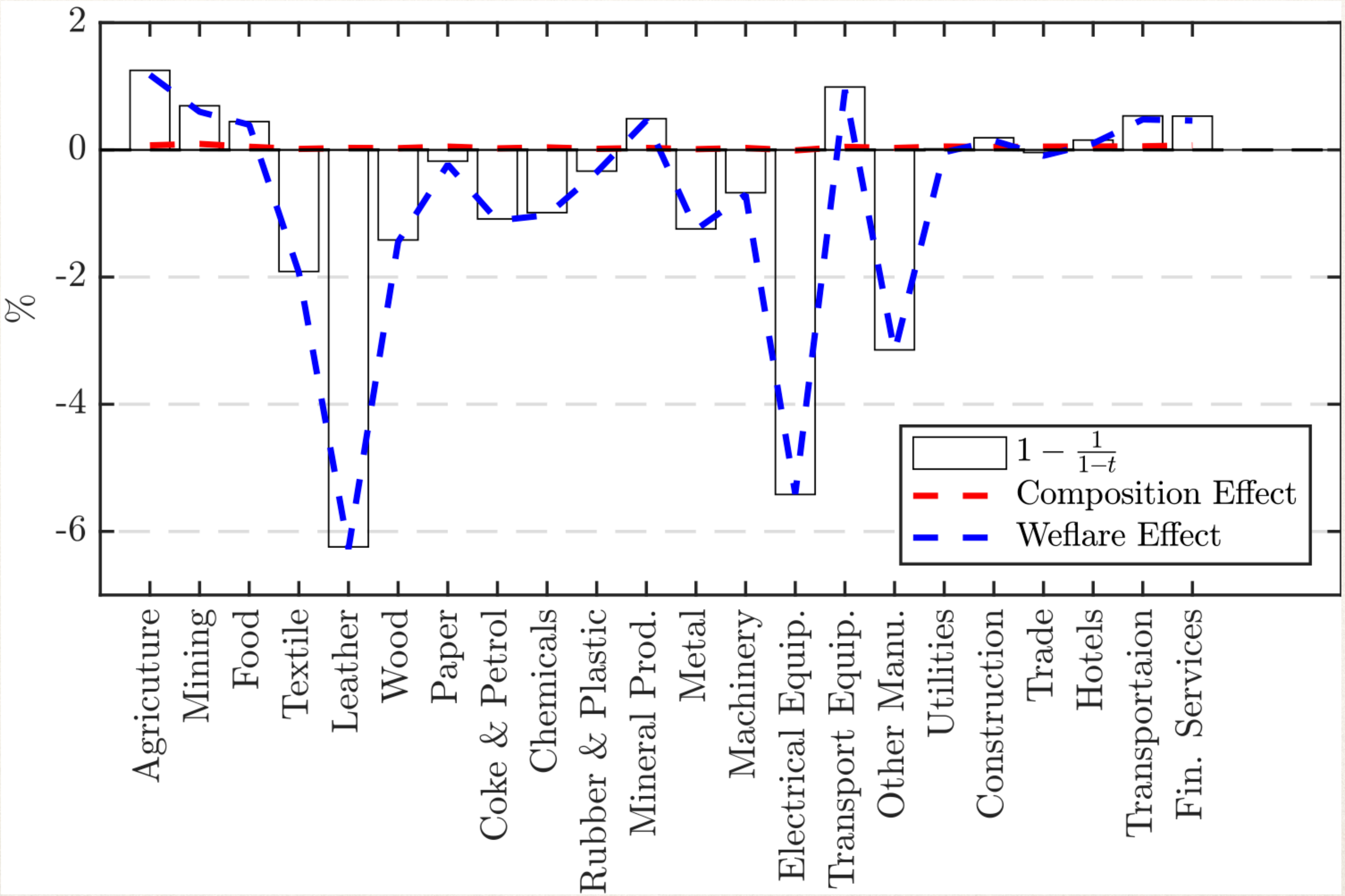


Employment Change



OPTIMAL TAXES - DECOMPOSITION



Conclusion

- Developed a framework to analyze optimal taxation when trade creates winners and losers
- Optimal producer taxes:
  - VAT
  - Depend on degree of specialization of the labor force
- China shock: significant variation in across sectors; distortionary to trade
- Important question: dynamic effects

Additional Slides

Quantitative Model : Details

- Two types of goods in each sector:
  - Tradable intermediate goods and non-tradable final goods
- Continuum of varieties of intermediate goods in each sector
- Final goods can be used for consumption or in production
- Workers problem is the same as before

Quantitative Model : Details

- Continuum of varieties in intermediate goods

$$q_j^c(\omega_j) = a_j^c(\omega_j)\left(L_j^c(\omega_j)\right)^{\chi_j^c} \prod_{k=1}^{N_J}\left(M_{j,k}^c(\omega_j)\right)^{\gamma_{j,k}^c}, \quad \sum_{k=1}^{N_J} \gamma_{j,k}^c = 1 - \chi_j^c.$$

variety: $\omega_j \in [0,1]$

- Assume a_j^c has a Frechet distribution

$$F_j^c(a) = e^{-\lambda_j^c a^{-\nu}}$$

Sectoral TFP

Trade elasticity

Quantitative Model : Details

- Unit cost in sector *j* in country *c:*

$$\psi_j^c = \left(\frac{w_j^c}{\left(1 - t_j^{c,p}\right) \chi_j^c} \right)^{\chi_j^c} \prod_{k=1}^{N_J} \left(\frac{P_k^c}{\gamma_{j,k}^c} \right)^{\gamma_{j,k}^c}$$

Wage of *j* in *c*

Price of *k* in *c*

Quantitative Model : Details

- Trade cost:
  - ⋆ $\tau_j^{c,c'}$: cost of shipping j from c' to c
  - ⋆ $X_j^{c,c'}$: expenditure in c on j produced in c'; X_j^c: expenditure on j in c

$$\pi_j^{c,c'} \equiv \frac{X_j^{c,c'}}{X_j^c} = \frac{\lambda_j^{c'} \left(\tau_j^{c,c'} \psi_j^{c'}\right)^{-\nu}}{\sum_{c''} \lambda_j^{c''} \left(\tau_j^{c,c''} \psi_j^{c''}\right)^{-\nu}}$$

Back