

RECIPROCITY AND THE CHINA SHOCK

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- Did a failure of China's WTO accession protocol to deliver reciprocity contribute to the “China Shock” experienced in the United States?
- General Research Question: What is the link between *reciprocity* in tariff negotiations and the magnitude of the *labor-market adjustments* that can be expected under negotiations that abide by reciprocity?

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- What we offer is **a first formal analysis of this link**, and **a quantitative analysis of its importance** for the US labor market in the context of the China Shock and also for labor markets globally

Main Findings

- Our analytical results extend findings on the potential benefits of reciprocity in trade agreements (Bagwell and Staiger, 1999, 2002) to the consideration of labor-market disruption
- We demonstrate how these results translate naturally from canonical neoclassical trade models to a variety of workhorse quantitative trade models (EK, CDK, CP) where closed-form expressions for labor-market dislocation can be derived

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- But it amplified the magnitude of the China Shock experienced by the United States and other countries that was attributable to tariff changes over the post-China-WTO-accession period
 - The contribution of China's deviation from reciprocity to the China Shock in the United States was roughly comparable in magnitude to the contribution of the US's own tariff cuts over this period
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- And compared to the results with no intermediate goods (EK, CDK), we find that the presence of intermediate goods magnified these effects (CP)
- In this sense, our quantitative results confirm the relative significance of deviations from reciprocity for understanding how negotiated tariff liberalization implemented over the 1990-2007 period contributed to the size of the China Shock experienced by the United States

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Institutional Background

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- But negotiations over China's accession to the WTO may have been an important exception
 - Negotiators sought reciprocity (e.g., statements of WTO Working Group on China's accession)
 - But they may not have achieved it (e.g., statements of USTR)
 - And if reciprocity was not achieved, the labor-market consequences of deviations from reciprocity could be consequential due to China's economic size

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- Applying trade balance at initial and new tariffs to reciprocity condition implies

$$\left[\left(\frac{p_m^w}{p_s^w}\right)^1 - \left(\frac{p_m^w}{p_s^w}\right)^0\right] \times M^1 = 0 \implies \text{terms of trade fixed under reciprocal tariff changes}$$

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- Absent Lerner Paradox, $\left(\frac{p_m^w}{p_s^w}\right)$ rises (falls) if foreign tariff cut falls short of (exceeds) the level needed to reciprocate home tariff cut
 - Bagwell and Staiger emphasize the terms-of-trade-fixing properties of reciprocity for its implied ability to eliminate terms-of-trade manipulation and the associated inefficient international cost-shifting incentives from each country's tariff choices
 - We focus on the implications of reciprocity for changes in *local* relative prices and the implied labor market dislocation

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- **Proposition 1.** *In the two-good two-country neoclassical trade model, a country's own tariff changes are a sufficient statistic for calculating the labor market dislocation it will experience as a result of negotiated tariff liberalization with its trading partner if and only if those tariff negotiations conform with the reciprocity norm.*

Reciprocity in the Eaton and Kortum Model

- $z = (z_1, \dots, z_N)$ is the vector of technology draws (output per worker) for any given tradable good for the N countries, with $z \in \mathbb{R}_+^N$
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- A tradable good $z = (z_1, \dots, z_N)$ is available in country i at unit prices

$$\frac{w_1 \kappa_{i1} \tau_{i1}}{z_1}, \frac{w_2 \kappa_{i2} \tau_{i2}}{z_2}, \dots, \frac{w_N \kappa_{iN} \tau_{iN}}{z_N}.$$

- Country i buys from the lowest cost suppliers in the world, hence the effective price of any good z in country i is given by

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- The “world” (exporter) price of good z between country i and the lowest cost supplier country n is

$$p_{in}^w(z) \equiv \frac{p_i(z)}{\tau_{in}} = \frac{w_n \kappa_{in}}{z_n}$$

Reciprocity in the Eaton and Kortum Model

- Reciprocity for country i

$$\int_{B_{in}^1} \hat{p}_{in}^{w0}(z) D_i^1(z) \phi(z) dz - \int_{B_{in}^0} \hat{p}_{in}^{w0}(z) D_i^0(z) \phi(z) dz = \\ \int_{B_{ni}^1} \hat{p}_{ni}^{w0}(z) D_n^1(z) \phi(z) dz - \int_{B_{ni}^0} \hat{p}_{ni}^{w0}(z) D_n^0(z) \phi(z) dz$$

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- Defining $\omega_n \equiv w_n/w_i$ and applying trade balance at initial/new tariffs, reciprocity implies

$$(\omega_n^1 - \omega_n^0) D_{in}^1 = 0 \implies \omega_n / \text{terms of trade fixed under reciprocal tariff changes}$$

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- Defining D_{in} as the labor content of the volume of country i 's imports from country n inclusive of trade costs, reciprocity can be rewritten as $w_n^0 (D_{in}^1 - D_{in}^0) = w_i^0 (D_{ni}^1 - D_{ni}^0)$
- Trade balance for country i

$$\sum_{n \neq i} \int_{B_{in}} p_{in}^w(z) D_i(z) \phi(z) dz = \sum_{n \neq i} \int_{B_{ni}} p_{ni}^w(z) D_n(z) \phi(z) dz$$

- can be rewritten at the initial and new tariffs as $w_n^0 D_{in}^0 = w_i^0 D_{ni}^0$ and $w_n^1 D_{in}^1 = w_i^1 D_{ni}^1$
- Defining $\omega_n \equiv w_n/w_i$ and applying trade balance at initial/new tariffs, reciprocity implies $(\omega_n^1 - \omega_n^0) D_{in}^1 = 0 \implies \omega_n$ / **terms of trade fixed under reciprocal tariff changes**
- Country- n relative wage ω_n / terms of trade falls (rises) if country- i tariff cut falls short of (exceeds) the level needed to reciprocate country- n tariff cut

Reciprocity in the Eaton and Kortum Model

- Reciprocity for country i

$$\int_{B_{in}^1} \hat{p}_{in}^{w^0}(z) D_i^1(z) \phi(z) dz - \int_{B_{in}^0} \hat{p}_{in}^{w^0}(z) D_i^0(z) \phi(z) dz =$$
$$\int_{B_{ni}^1} \hat{p}_{ni}^{w^0}(z) D_n^1(z) \phi(z) dz - \int_{B_{ni}^0} \hat{p}_{ni}^{w^0}(z) D_n^0(z) \phi(z) dz$$

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- $$(\omega_n^1 - \omega_n^0) D_{in}^1 = 0 \implies \omega_n / \text{terms of trade fixed under reciprocal tariff changes}$$
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 - Reciprocal tariff cut for country i is

$$\frac{d \ln \tau_{in}}{d \ln \tau_{ni}} = \frac{\tilde{\pi}_{nn}}{\tilde{\pi}_{ii}}, \quad \text{with } \tilde{\pi}_{ii} = \frac{\pi_{ii} \tau_{in}}{1 + \pi_{ii} (\tau_{in} - 1)}$$

- Introduce a non-tradable (services) sector, and associate labor market dislocation with the loss of jobs in the tradable sector

$$d\ln L_n^T = -\frac{L_n^{NT}}{L_n^T} \frac{L_n^{NT}}{L_n} \frac{1}{(1-\alpha)} \left[\frac{\alpha (1 - \pi_{nn}^T) \pi_{nn}^T (\tau_{ni} - 1) \theta}{\tau_{ni}} \right] d\ln \omega_n$$
$$- \frac{L_n^{NT}}{L_n^T} \frac{L_n^{NT}}{L_n} \frac{1}{(1-\alpha)} \left[\frac{\alpha (1 - \pi_{nn}^T) (1 - \pi_{nn}^T) (\tau_{ni} - 1) \theta}{\tau_{ni}} \right] d\ln \tau_{ni}$$

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- Extends naturally to many countries and many tradable sectors

$$d \ln L_n^T = - \frac{L_n^{NT}}{L_n^T} \frac{L_n^{NT}}{L_n} \frac{1}{\alpha_n^{NT}} \left[\sum_{i=1}^N \sum_{s=1}^J \frac{\alpha_n^s \pi_{ni}^s (\tau_{ni}^s - 1) \theta^s}{\tau_{ni}^s} \right] d \ln \omega_{ni}$$

$$- \frac{L_n^{NT}}{L_n^T} \frac{L_n^{NT}}{L_n} \frac{1}{\alpha_n^{NT}} \left[\sum_{i=1}^N \sum_{s=1}^J \left[\alpha_n^s \theta^s \pi_{ni}^s \sum_{m=1}^N \frac{\pi_{nm}^s (\tau_{nm}^s - 1)}{\tau_{nm}^s} + \frac{\pi_{ni}^s [1 - \theta^s (\tau_{ni}^s - 1)]}{\tau_{ni}^s} \right] \right] d \ln \tau_{ni}^s$$

- **Proposition 9.** *In a many-country Eaton and Kortum (2002) world with a non-tradable sector and many tradable sectors, if the rest of the world's tariff cuts fall short of (exceed) those necessary to reciprocate the tariff cuts of country n , country n 's labor market dislocation will be dampened (amplified) compared to the dislocation that country n would experience under reciprocal tariff cuts from the rest of the world.*

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- **Corollary** *In this world, a country's own tariff changes are a sufficient statistic for calculating the labor-market dislocation it will experience as a result of negotiated tariff liberalization with its trading partners if and only if those tariff negotiations conform with multilateral reciprocity.*
- We also derive an expression for labor market dislocation within the tradable sector

$$d\ln \frac{L_{nn}}{L_n} = - \left(\frac{(1 - \pi_{nn}) \theta}{1 + (\tau_{ni} - 1) \pi_{nn}} \right) d\ln \omega_n + \left(\frac{(1 - \pi_{nn}) (1 + \theta)}{1 + (\tau_{ni} - 1) \pi_{nn}} \right) d\ln \tau_{ni}$$

- When $d\ln \frac{L_{nn}}{L_n} < 0$, country n 's labor in the tradable sector must reallocate from production that serves domestic demand to export-oriented production
- The analog of Proposition 9 and its Corollary hold for this within-sector measure of labor market dislocation

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- Tariff changes that fix $c_{n,j}$ and $c_{i,j}$ for all j , and hence fix the terms of trade sector by sector, will satisfy reciprocity
 - With one tradable sector, this is the only solution so, defining $\tilde{\omega}_n \equiv c_n/c_i$,
 $\implies \tilde{\omega}_n$ /terms of trade fixed under reciprocal tariff changes
 - But with many tradable sectors, reciprocity might also be satisfied with changes in $c_{n,j}$ and $c_{i,j}$ for some j 's, provided these changes balance out in a way that fixes each country's overall terms of trade

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- In our quantitative work, when we introduce intermediate goods we will restrict attention to a world with one tradable sector to avoid this possible multiplicity
 - Future work: allow for intermediate goods and many traded sectors and search for other possible solutions to reciprocity

- Introduce a non-tradable (services) sector, and associate labor market dislocation with the loss of jobs in the tradable sector

$$d\ln L_n^T = -\frac{L_n^{NT}}{L_n^T} \frac{L_n^{NT}}{L_n} \frac{\beta}{(1-\alpha)} \left[\frac{\alpha (1 - \pi_{nn}^T) \pi_{nn}^T (\tau_{ni} - 1) \theta \tau_{ni}}{(\tau_{ni} - (1 - \beta) (1 + (\tau_{ni} - 1) \pi_{nn}^T))^2} \right] d\ln \tilde{\omega}_n$$

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- **Proposition 13.** *In a two-country Caliendo and Parro (2015) world, if country i 's tariff cuts fall short of (exceed) those necessary to reciprocate the tariff cuts of country n , country n 's labor market dislocation will be dampened (amplified) compared to the dislocation that country n would experience under reciprocal tariff cuts from country i .*
- **Corollary** *In this world, a country's own tariff changes are a sufficient statistic for calculating the labor-market dislocation it will experience as a result of negotiated tariff liberalization with its trading partner if and only if those tariff negotiations conform with the reciprocity norm.*

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- Extends naturally to many countries, under multilateral reciprocity
 - but must be qualified with many tradable sectors

- China joined the WTO on December 11 2001
- Secured from the United States and other WTO members a promise of Permanent Normal Trade Relations (PNTR)
 - A grant to China on a permanent basis of the tariff reductions embodied in the on-going phase-ins of market access commitments that had been agreed at the 1995 conclusion of the Uruguay Round of GATT negotiations
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- Data: WIOD; tariffs CFRT (2023), Elasticities CP (2015)

Quantitative Analysis: Results

- We start with a two-country (China and ROW) two sector (one tradable sector and one non-tradable sector) Eaton and Kortum (2002) model

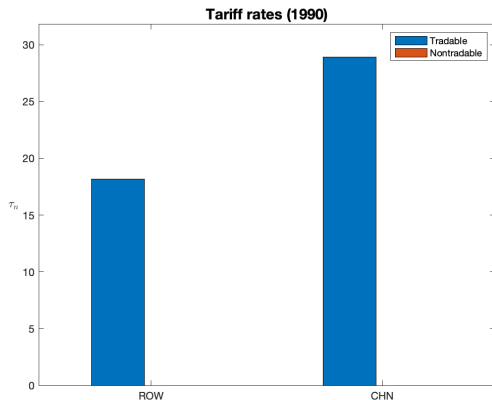


Figure 1: Initial Tariffs 1990

Note: The figure presents 1990 trade-weighted tariffs between China and the rest of the world constructed with the tariff dataset from Caliendo et al. (2023).

- Reciprocal tariff changes

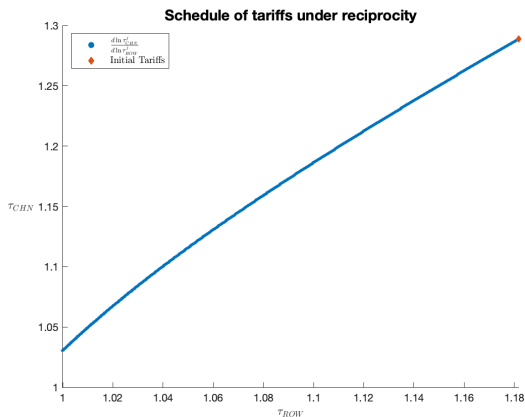


Figure 2: Tariff schedules under reciprocity

Note: The figure presents the schedule of reciprocal tariff changes applied between China and the rest of the world starting from the initial equilibrium in 1990. The axes show the reciprocal ad-valorem tariff applied between China and the rest of the world.

- Welfare effects of reciprocal tariff changes

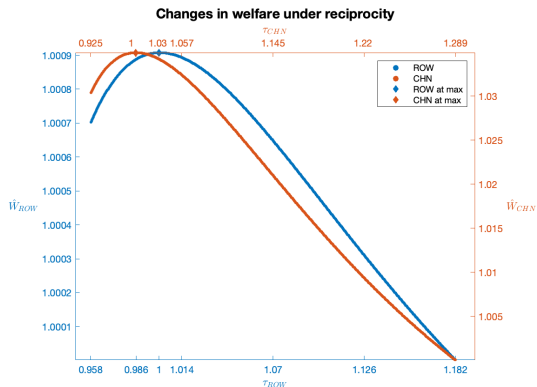


Figure 3: Welfare effects of reciprocity

Note: The figure presents the welfare effects of the reciprocal tariff schedule between China and the rest of the world. The bottom and left axes (in blue) show the reciprocal tariff schedule and the welfare effects for the rest of the world, the right and top axes (in red) show the same figures for China. The axes show the ad-valorem tariff applied between China and the rest of the world.

- Terms of trade effects from hypothetical Chinese deviations from reciprocity

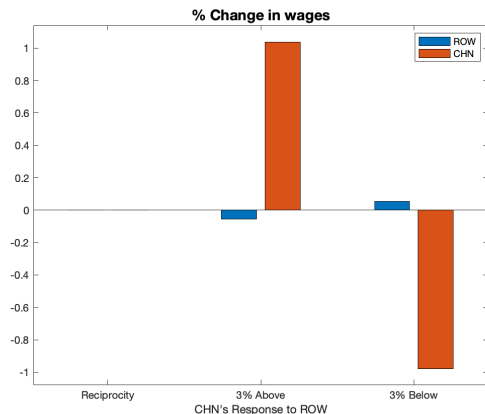


Figure 4: Terms of trade effects

Note: The figure presents the changes in relative wages for different scenarios, under reciprocity, and with China imposing a twenty percentage points change in tariffs above and below reciprocal tariffs from the rest of the world.

Quantitative Analysis: Results

- Reciprocal and actual tariff changes: Chinese tariff cuts exceeded those needed to reciprocate tariff cuts from ROW

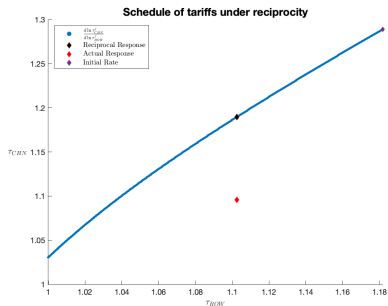


Figure 5a: Reciprocal and actual tariff changes

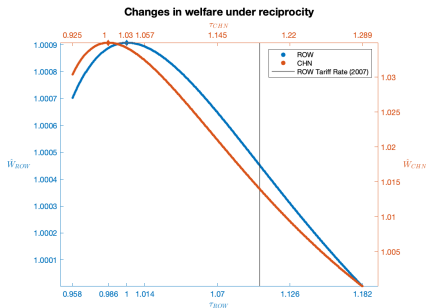


Figure 5b: Welfare under reciprocal and actual tariff changes

Note: The left panel in the figure presents the schedule of reciprocal tariffs between China and the rest of the world starting from the initial equilibrium in 1990, and the actual tariff applied between China and the rest of the world in 2007. The axes show the ad-valorem tariff applied between China and the rest of the world. The right panel presents the welfare effects of the reciprocal tariff schedule between China and the rest of the world. The bottom and left axes (in blue) show the reciprocal tariff schedule and the welfare effects for the rest of the world, the right and top axes (in red) show the same outcomes for China.

- China's deviation from reciprocity amplified employment dislocation in ROW

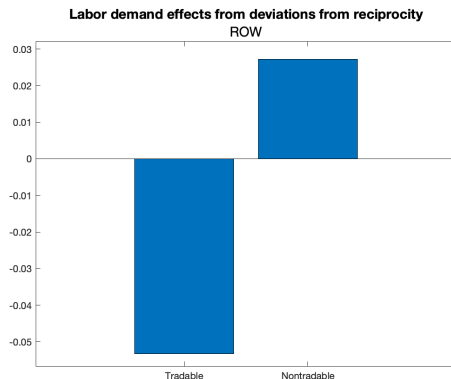


Figure 6: Employment effects across sectors in the rest of the world

Note: The figure presents the employment effects in the tradable sector and in the non-tradable sector in the rest of the world resulting from the change in wages due to the actual changes in tariffs between China and the rest of the world over the period 1990-2007.

- Employment dislocation by ROW countries from China's deviation from reciprocity

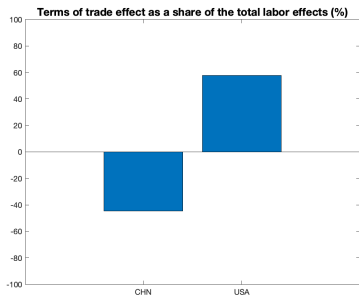


Figure 7a: Employment dislocation from bilateral tariff changes

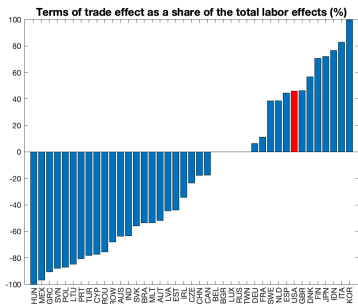


Figure 7b: Employment dislocation from multilateral tariff changes

Note: The left panel in the figure presents the employment dislocation effects from a bilateral change in tariffs between China and the United States over the period 1990-2007. The right panel shows the employment dislocation effect across countries from multilateral changes in tariffs over the period 1990-2007. The employment effects in the non-tradable sector due to the deviations from reciprocity are computed as the percentage change in employment in the non-tradable sector due to deviation from reciprocity as a share of absolute employment effects.

- What about employment dislocation within the tradable sector?

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- We find that the improvement in ROW terms of trade attributable to China exceeding reciprocity resulted in a within-sector employment dislocation of 0.76% in the rest of the world
 - Put differently, the share of workers in the tradable sector devoted to exported varieties in the rest of the world would have fallen by 0.76 percentage points less if China had conformed to reciprocity
- Intuitively, the terms-of-trade improvement experienced by the rest of the world resulted in access to cheaper imported varieties that before were produced domestically, which moved employment away from those varieties within the tradable sector

- Intermediate goods and employment dislocation in ROW from China's deviation from reciprocity

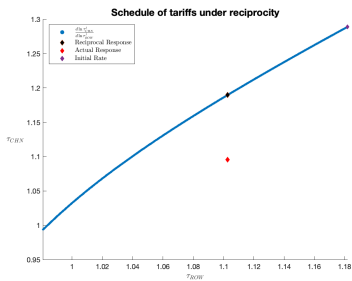


Figure 9a: Reciprocal and actual tariff changes

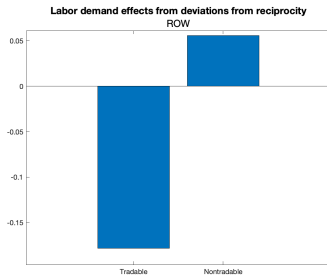


Figure 9b: Employment effects across sectors in the rest of the world

Note: The left panel in the figure presents the schedule of reciprocal tariffs between China and the rest of the world starting from the initial equilibrium in 1990, and the actual tariff applied between China and the rest of the world in 2007. The axes shows the ad-valorem tariff applied between China and the rest of the world. The right panel the employment effects in the tradable sector and in the non-tradable sector in the rest of the world resulting from the change in wages due to the actual changes in tariffs between China and the rest of the world over the period 1990-2007.

China's Growing Trade Surplus

- China's trade surplus grew from 1 percent to 10 percent of its GDP between 2001 and 2007
 - Treating these changing trade imbalances as exogenous to tariff negotiations, by the logic of the transfer problem they could have terms-of-trade effects of their own

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- Expanded reciprocity

$$w_i^0 (D_{ni}^1 - D_{ni}^0) - w_n^0 (D_{in}^1 - D_{in}^0) = (TB_i^1 - TB_i^0)$$

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 - Would the China Shock experienced by other countries have been materially different?
- Expanded reciprocity

$$w_i^0 (D_{ni}^1 - D_{ni}^0) - w_n^0 (D_{in}^1 - D_{in}^0) = (TB_i^1 - TB_i^0)$$

- Loss of jobs in the tradable sector

$$\begin{aligned} d\ln L_n^T &= -\frac{L_n^{NT}}{L_n^T} \frac{L_n^{NT}}{(L_n - TB_n)} \frac{1}{(1-\alpha)} \left[\frac{\alpha (1 - \pi_{nn}^T) \pi_{nn}^T (\tau_{ni} - 1) \theta}{\tau_{ni}} \right] d\ln \omega_n \\ &+ \frac{L_n^{NT}}{L_n^T} \frac{L_n^{NT}}{(L_n - TB_n)} \frac{1}{(1-\alpha)} \left[\frac{\alpha (1 - \pi_{nn}^T) (1 - \pi_{nn}^T) (\tau_{ni} - 1) \theta}{\tau_{ni}} \right] d\ln \tau_{ni} \\ &+ \frac{L_n^{NT}}{L_n^T (L_n - TB_n)} [TB_n] d\ln TB_n \end{aligned}$$

China's Growing Trade Surplus: Quantitative Results

Table 1: China's Reciprocal Tariffs

Initial (2000)	Actual (2007)	Balanced trade	Constant surplus	Growing surplus
1.29	1.1	1.19	1.18	1.23

Table 2: Employment effects from deviation from reciprocity

	ROW		China	
	Non-tradable	Tradable	Non-tradable	Tradable
Balanced trade	0.027%	-0.054%	0.570%	0.376%
Constant trade imbalances	0.025%	-0.049%	0.546%	0.355%
Growing trade surplus	0.035%	-0.068%	0.599%	0.389%
Reciprocity over initial China's surplus	0.008%	-0.016%	0.560%	0.036%

- \implies In the presence of China's growing trade surpluses, while tradable employment in the rest of the world would have been 0.016% higher if China had conformed to reciprocity as traditionally defined, it would have been 0.068% higher if China had conformed to extended reciprocity

- What is the link between reciprocity in tariff negotiations and the magnitude of the labor-market adjustments that can be expected under negotiations that abide by reciprocity?
- Our analytical results extend findings on the potential benefits of reciprocity in trade agreements to the consideration of labor-market disruption
- We demonstrate how these results translate naturally from canonical neoclassical trade models to a variety of workhorse quantitative trade models where closed-form expressions for labor-market dislocation can be derived
- Our quantitative results indicate that China exceeded reciprocity when it joined the WTO
 - leading to improved terms of trade and higher aggregate incomes for the rest of the world
 - but also amplifying the magnitude of the China Shock experienced by the United States and other countries attributable to tariff changes over the post-China-WTO-accession period
- The contribution of China's deviation from reciprocity to the China Shock in the United States was roughly comparable in magnitude to the contribution of the US's own tariff cuts over this period
- And compared to the results with no intermediate goods, we find that the presence of intermediate goods magnified these effects
- In this sense, our quantitative results confirm the relative significance of deviations from reciprocity for understanding how negotiated tariff liberalization implemented over the 1990-2007 period contributed to the size of the China Shock experienced by the United States

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 - GATT/WTO rules are designed to respond to this kind of problem

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- Our quantitative results indicate that China did indeed fail to deliver reciprocity when it joined the WTO, but that in fact the tariff reductions that it implemented after its accession *exceeded* the norm of reciprocity
 - As we have observed, this led to higher aggregate real incomes in the United States and in the rest of the world as a whole through improvements in their terms of trade but also amplified the magnitude of the China Shock

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- GATT/WTO rules can in principle be utilized to address this kind of problem, but in practice they were not well-utilized
 - An important open question is why not

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- A possible resolution is that China's policies worsened its terms of trade, as we have found, in which case there is no tension between
 - claims that China has not opened its own markets to imports sufficiently (relative to the reciprocity norm), and
 - claims that China has taken actions that unduly stimulate its exports (relative to the reciprocity norm)