TRADE LIBERALIZATION, MACROECONOMIC ADJUSTMENT AND WELFARE: UNIFYING TRADE AND MACRO MODELS

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Effects of Trade Liberalization

*Trade Models*
- Concerned with long-run effects
- Nominal rigidities are absent

*Macro Models*
- Focus on short-run effects
- Nominal rigidities play an important role
- Short-run adjustment depends on monetary policy and can lead to unfavorable conditions
- Welfare implications not explored in early macro models
Need for an Integrated Framework

- In measuring the effect of trade liberalization on welfare, an integrated framework is needed to take both short- and long-run adjustment into account.

- Trade and macro models are getting closer.

- But some important differences remain between the two types of models.

- This paper uses a hybrid model that captures key features of the two approaches.
Issues Addressed in the Paper

• Why does the short-run (macro) adjustment to trade liberalization differ from the long-run adjustment?

• How does monetary policy influence short-run adjustment?

• What is the welfare cost of macro adjustment, and how large is this cost in relation to long-term gains?

• What policy action can reduce macro adjustment costs?
Basic Setup

- Two countries: a small home and a large foreign country
- Two goods, $M$ and $X$, use labor and good-specific capital
- Capital endowments are fixed (as in trade models)
- Labor supply is variable (as in macro models).
- Monopolistic competition in goods and labor markets
- Changes in wages and prices are subject to adjustment costs
- Unrestricted International borrowing or lending
Utility and Consumption

\[ U_t = \sum_{s=t}^{\infty} \beta^{s-t} u(C_s, L_s), \quad u_s(C_s, L_s) = \left( \frac{C_s^{1-\rho}}{1-\rho} - \frac{\psi L_s^{1+\mu}}{1+\mu} \right) \]

\[ C_t = \left[ \chi_M^{1/\eta} C_{M,t}^{(\eta-1)/\eta} + \chi_X^{1/\eta} C_{X,t}^{(\eta-1)/\eta} \right]^{\eta/(\eta-1)} \]

\[ C_{T,t} = \left[ \chi_{TH}^{1/\theta_T} C_{TH,t}^{(\theta_T-1)/\theta_T} + \chi_{TF}^{1/\theta_T} C_{TF,t}^{(\theta_T-1)/\theta_T} \right]^{\theta_T/(\theta_T-1)}, \quad T = M, X \]

\[ C_{TH,t} = \left[ \int_0^1 C_{TH,t}(h)^{(\varepsilon_T-1)/\varepsilon_T} dh \right]^{\varepsilon_T/(\varepsilon_T-1)}, \quad h \in [0,1] \]

\[ C_{TF,t} = \left[ \int_0^1 C_{TF,t}(f)^{(\varepsilon_T-1)/\varepsilon_T} df \right]^{\varepsilon_T/(\varepsilon_T-1)}, \quad f \in [0,1] \]
Production

\[ Y_{M,t} = \left[ \alpha_M^{1/\sigma} L_{M,t}^{(\sigma-1)/\sigma} + (1 - \alpha_M)^{1/\sigma} K_{M,t}^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)} \]

\[ Y_{X,t} = \left[ \alpha_X^{1/\sigma} L_{X,t}^{(\sigma-1)/\sigma} + (1 - \alpha_X)^{1/\sigma} K_{X,t}^{(\sigma-1)/\sigma} \right]^{\sigma/(\sigma-1)} \]

\[ K_{M,t} = \bar{K}_{M,t}, \quad K_{X,t} = \bar{K}_{X,t} \]

\[ L_{M,t} = \left[ \int_0^1 L_{M,t} (l)^{(\varepsilon_l-1)/\varepsilon_l} \, dl \right]^{\varepsilon_l/(\varepsilon_l-1)} \]

\[ L_{X,t} = \left[ \int_0^1 L_{X,t} (l)^{(\varepsilon_l-1)/\varepsilon_l} \, dl \right]^{\varepsilon_l/(\varepsilon_l-1)} \quad , l \in [0,1] \]

\[ L_t = L_{M,t} + L_{X,t} \]
Optimization

• Households choose consumption and set the wage rate to maximize lifetime utility
• Wage adjustment costs are

\[
AC_{W,t}(l) = \frac{\omega_W}{2} \left( \frac{W_{L,t}(l)}{W_{L,t-1}(l)} - 1 \right)^2
\]

• Firms set prices for home and foreign markets to maximize the present discounted value of profits
• Prices for both markets are set in terms of the home currency
• Price adjustment costs are

\[
AC_{T,t}(h) = \frac{\omega_P}{2} \left( \frac{P_{TH,t}(h)}{P_{TH,t-1}(h)} - 1 \right)^2, \ T = M, X,
\]
Monetary Policy Regimes

Fixed Exchange Rates:

\[ S_t = \bar{S} \]

Flexible Exchange Rates:

\[ P_t = \bar{P} \]

Interest Rate rule (Flexible Price Level Targeting)

\[ R_t = \bar{R} + \delta \log(P_t / \bar{P}), \quad \delta > 0 \]
Parameterization

- We calibrate the model for a small emerging economy
- Home tariffs equal 20%, foreign tariffs equal 10%
- Key parameter values:
  
  Utility Parameters: $1/\rho = 0.5, 1/\mu = 0.25$

  Substitution Elasticities:
  $\eta = 3.0, \theta_M = \theta_X = 6.0, \varepsilon_M = \varepsilon_X = \varepsilon_L = 8.0$

  Technology Parameters: $\sigma = .9, \alpha_M = .61, \alpha_X = .76$

  Adjustment Costs: $\omega_P = \omega_W = 800$
Quantitative Analysis

*Experiment:*

- A unilateral reduction of home tariffs from 20% to 10%

*Macroeconomic Adjustment:*

- Examine the dynamic response of model variables to tariff reduction under pure fixed and flexible exchange rates
- Compare responses in the baseline model with those in a model with no nominal rigidities \((\omega_p = \omega_w = 0)\)

*Welfare:*

- Estimate the total effect
- Decompose the total effect into steady-state and transitional effects
Dynamic Response of Output

![Graph showing dynamic response of output with three lines representing different levels of rigidity. The x-axis represents time, and the y-axis represents output values. The graph compares No Rigidities, Flexible ER, and Fixed ER scenarios. The output values range from 0.8 to 1.2.](image-url)
Dynamic Response of Employment

![Graph showing dynamic response of employment with lines for No Rigidities, Flexible ER, and Fixed ER.]
Dynamic Response of Consumption

![Graph showing consumption over time with different rigidities.]

Legend:
- No Rigidities
- Flexible ER
- Fixed ER
Dynamic Response of the Current Account

![Graph showing dynamic response of the current account with different scenarios: No Rigidities, Flexible ER, Fixed ER.]
Dynamic Response of the Interest Rate

![Graph showing the dynamic response of the interest rate with a label for different interest rate levels and a legend indicating Flexible ER and Fixed ER.]
Total Welfare Effect

- Use an equivalent-variation index

- Total welfare effect ($\gamma$): the constant amount (as a fraction of initial steady-state consumption) that needs to be given to households to make them indifferent between the initial steady state and the new state (including transition)

$$\sum_{s=0}^{\infty} \beta^s u[(1 + \gamma)\bar{C}, \bar{L}] = \sum_{s=t_0}^{\infty} \beta^{s-t_0} u(C_s, L_s)$$

A bar denotes initial steady state value
Steady-State and Transitional Effects

- Steady-state welfare effect ($\gamma_{SS}$): the constant amount (as a fraction of initial steady-state consumption) that needs to be given to households to make them indifferent between the initial steady state and the new steady state

\[
u[(1 + \gamma_{SS})\tilde{C}, \tilde{L}] = u(\tilde{C}, \tilde{L})
\]

A tilde denotes new steady state value

- Transitional welfare effect ($\gamma_{TR}$) is determined residually

\[
\gamma = \gamma_{TR} + \gamma_{SS}
\]
## Welfare Effects of Trade Liberalization

<table>
<thead>
<tr>
<th></th>
<th>Total Effect (%)</th>
<th>Transitional Effect (%)</th>
<th>Steady-State Effect (%)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Fixed ER</td>
<td>Flexible ER</td>
<td>Fixed ER</td>
</tr>
<tr>
<td>Baseline Model</td>
<td>0.32972</td>
<td>0.34061</td>
<td>-0.04672</td>
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<td>Variation 1</td>
<td>0.40156</td>
<td>0.44428</td>
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<td>Variation 2</td>
<td>0.30710</td>
<td>0.32511</td>
<td>-0.04137</td>
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</tbody>
</table>
Appropriate Interest Rate Response

- For large values of $\delta$, dynamic response of real variables under the interest rate rule is close to that under pure flexible exchange rates.
- As $\delta$ decreases, the path of real variables moves towards the no-nominal-rigidities path.
Sensitivity Analysis

Variations in $\rho$, $\mu$ and $\varepsilon_L$

- These variations have little effect on the steady-state welfare measure
- The transitional loss responds differently under fixed and flexible exchange rates, but remains small
- A decrease in $\delta$ always reduces the transitional loss
- The transitional loss is generally smaller under flexible exchange rates, but varies over a wider range

Variations in $\omega_w$ and $\omega_p$

- An increase (decrease) in these parameters raises (lowers) the transitional loss
- The loss increases in $\delta$ more rapidly under flexible than under fixed exchange rates but remains small under both regimes.
No International Capital Mobility

- Interesting to examine the cost of macroeconomic adjustment for a financially-closed economy

- Without international borrowing, consumption must match the output response

- Under fixed exchange rates, there is a significant initial decrease in consumption (because of output decline) in response to tariff cuts

- The reduction in consumption causes considerable transitional loss that offsets much of the long-run gain

- Alternative monetary policies can still prevent large transitional losses
Conclusions

- Macroeconomic adjustment to tariff reduction causes a short-run loss that tends to be higher under fixed than flexible exchange rates.

- The short-run loss is small relative to the long-run gain from tariff cuts.

- Macroeconomic adjustment costs can be avoided by appropriate monetary policy.