Unbalanced Trade

Robert Dekle
University of Southern California, Los Angeles

Jonathan Eaton
New York University

Samuel Kortum
University of Chicago

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The External Deficits of the United States ($ billion in 2006)

- current account: 857
- goods and services: 764
- goods: 836
- petroleum: 271
Introduction

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- When the inevitable adjustment happens, how bad is it going to be for the USA?
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What happens to the big surplus countries (e.g., Japan, Germany, and China)

Will there be spillovers to neighbors?
<table>
<thead>
<tr>
<th>Country</th>
<th>GDP</th>
<th>Deficits</th>
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<td>Belgium/Luxembourg</td>
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<td>Brazil</td>
<td>604</td>
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<td>Denmark</td>
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<tr>
<td>Ireland</td>
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<td>Italy</td>
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<td>Malaysia</td>
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<td>New Zealand</td>
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<tr>
<td>Norway</td>
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<td>-35.1</td>
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<td>Pakistan</td>
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<td>Philippines</td>
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<td>-1.7</td>
</tr>
<tr>
<td>Portugal</td>
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<tr>
<td>Russia</td>
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<td>Singapore</td>
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<td>Sweden</td>
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</tr>
<tr>
<td>Switzerland</td>
<td>360</td>
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<tr>
<td>Thailand</td>
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<td>Turkey</td>
<td>302</td>
<td>15.2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2150</td>
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<tr>
<td>United States</td>
<td>11700</td>
<td>649.7</td>
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<tr>
<td>Venezuela</td>
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<tr>
<td>Rest of World</td>
<td>3025</td>
<td>-53.4</td>
</tr>
</tbody>
</table>

(US$ billions)
Introduction

What does it matter for?

- To balance current accounts what changes will be required in

Introduction
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- To balance current accounts what changes will be required in
  - relative factor prices and GDP’s
To balance current accounts what changes will be required in
relative factor prices and GDP’s
which are the nominal exchange rates if nominal GDP’s don’t change
Introduction
What does it matter for?

To balance current accounts what changes will be required in

- relative factor prices and GDP’s
  - which are the nominal exchange rates if nominal GDP’s don’t change
- real wages or real exchange rates
Introduction
What does it matter for?

- To balance current accounts what changes will be required in
  - relative factor prices and GDP’s
    - which are the nominal exchange rates if nominal GDP’s don’t change
  - real wages or real exchange rates
- We use a forty-four country model of production and bilateral trade to seek answers
Introduction
What does it matter for?

- To balance current accounts what changes will be required in
  - relative factor prices and GDP’s
    - which are the nominal exchange rates if nominal GDP’s don’t change
  - real wages or real exchange rates

- We use a forty-four country model of production and bilateral trade to seek answers

- Key to some answers is the degree of internal factor mobility
Introduction

The transfer problem

- Is there a secondary burden to ending current account deficits?
- Our model is with Keynes.
- But our numbers are with Ohlin.
Introduction

More recently

- Dornbusch, Fischer, and Samuelson (1977) analysis in a two-country model
Dornbusch, Fischer, and Samuelson (1977) analysis in a two-country model

- Show that Keynes was right about the terms of trade
Introduction
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  - Show that Keynes was right about the terms of trade
- A series of papers by Obstfeld and Rogoff (2000, 2005) with three “regions”
  - endowment economies
  - 3 world regions
  - focus on real exchange rates rather than relative wages and real absorption
Our framework
Manufacturing does the work

- Focus on manufactures, the largest component of trade
Our framework
Manufacturing does the work

- Focus on manufactures, the largest component of trade
  - Gross manufacturing output $Y_i^M$, gross manufacturing absorption $X_i^M$, and manufacturing deficit $D_i^M$:

$$Y_i^M = X_i^M - D_i^M$$
Our framework
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- Focus on manufactures, the largest component of trade
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    \[
    Y_i^M = X_i^M - D_i^M
    \]

- Manufacturing absorption:
  \[
  X_i^M = \alpha_i X_i + (1 - \gamma) (1 - \beta_i) Y_i^M
  \]
Our framework
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  X_i^M = \alpha_i X_i + (1 - \gamma)(1 - \beta_i) Y_i^M
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  - $\alpha_i$ share of mftr in final absorption (folding in use as intermediates in non-mftr)
Our framework
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- Focus on manufactures, the largest component of trade
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  - $\beta_i$ share of value added in mftr
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  \[ X_i^M = \alpha_i X_i + (1 - \gamma)(1 - \beta_i) Y_i^M \]

- $\alpha_i$ share of mftr in final absorption (folding in use as intermediates in non-mftr)
- $\beta_i$ share of value added in mftr
- $\gamma$ share of non-mftr in mftr intermediates
Our framework

Model Ingredients I

- Input costs $c_i$
Our framework

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- Input costs $c_i$
- Efficiency making particular good $j \ z_i(j)$
Our framework
Model Ingredients I

- Input costs $c_i$
- Efficiency making particular good $j$ $z_i(j)$
- Iceberg transport costs $d_{ni} \geq 1$ to deliver from $i$ to $n$. 
Our framework

Model Ingredients I

- Input costs $c_i$
- Efficiency making particular good $j$ $z_i(j)$
- Iceberg transport costs $d_{ni} \geq 1$ to deliver from $i$ to $n$.
- Cost of delivering a unit of good $j$ from $i$ to $n$ (gravity):

$$p_{ni} = \frac{d_{ni} c_i}{z_i(j)}$$
Distribution for $z$:

$$F(z) = e^{-T_i z^{-\theta}}$$
Our framework
Model Ingredients II

- Distribution for $z$:
  \[ F(z) = e^{-Tiz^{-\theta}} \]

- CES preferences (with elasticity of substitution $\sigma$)
Define:

$$
\Phi_n = \sum_{i=1}^{N} T_i (c_i d_{ni})^{-\theta}
$$

country $n$’s access to world technology adjusting for cost (input and transport)
Define:

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country \( n \)'s access to world technology adjusting for cost (input and transport)

Price Index:

\[ p_i = \gamma \Phi_n^{-1/\theta} \]
Define:

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country \( n \)'s access to world technology adjusting for cost (input and transport)

Price Index:

\[ p_i = \gamma \Phi_n^{-1/\theta} \]

Trade share:

\[ \pi_{ni} = \frac{T_i (c_i d_{ni})^{-\theta}}{\Phi_n} \]
Our framework

Implications

Define:

\[ \Phi_n = \sum_{i=1}^{N} T_i (c_i d_{ni})^{-\theta} \]

country n's access to world technology adjusting for cost (input and transport)

Price Index:

\[ p_i = \gamma \Phi_n^{-1/\theta} \]

Trade share:

\[ \pi_{ni} = \frac{T_i (c_i d_{ni})^{-\theta}}{\Phi_n} \]

World Manufacturing Equilibrium:

\[ Y_i^M = \sum_{n=1}^{N} \pi_{ni} X_i^M \]
Our framework
The factor markets

- Internal factor immobility
Our framework

The factor markets

- Internal factor immobility
- Endowments $L_i^M$ and $L_i^N$
Our framework
The factor markets

- Internal factor immobility
  - Endowments $L_i^M$ and $L_i^N$
  - Factor rewards $w_i^M$ and $w_i^N$
Our framework
The factor markets

- Internal factor immobility
  - Endowments $L_i^M$ and $L_i^N$
  - Factor rewards $w_i^M$ and $w_i^N$
  - $c_i = \kappa_i \left( w_i^M \right)^{\beta_i} \left( w_i^N \right)^{\gamma(1-\beta_i)} p_i^{(1-\gamma)(1-\beta_i)}$
Our framework
The factor markets

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Our framework

The factor markets

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  - $c_i = \kappa_i \left( w_i^M \right)^{\beta_i} \left( w_i^N \right)^{\gamma(1-\beta_i)} p_i^{(1-\gamma)(1-\beta_i)}$

- Internal factor mobility
  - Endowment $L_i = L_i^M + L_i^N$
Our framework

The factor markets

- **Internal factor immobility**
  - Endowments $L^M_i$ and $L^N_i$
  - Factor rewards $w^M_i$ and $w^N_i$
  - $c_i = \kappa_i \left( w^M_i \right)^{\beta_i} \left( w^N_i \right)^{\gamma(1-\beta_i)} p_i^{(1-\gamma)(1-\beta_i)}$

- **Internal factor mobility**
  - Endowment $L_i = L^M_i + L^N_i$
  - Factor reward $w_i$
Our framework

The factor markets

- **Internal factor immobility**
  - Endowments $L_i^M$ and $L_i^N$
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- **Internal factor mobility**
  - Endowment $L_i = L_i^M + L_i^N$
  - Factor reward $w_i$
  - $c_i = \kappa_i w_i^{\beta_i+\gamma(1-\beta_i)} p_i^{(1-\gamma)(1-\beta_i)}$
Calibration and Computation

Data

- Forty four countries in 2004
Calibration and Computation

Putting numbers on parameters

\[ \theta \]

Eaton and Kortum (2002) \[ \theta = 3.60 \]

Bernard, Eaton, Kortum, and Jensen (2003) \[ \theta = 8.28 \]

\[ \alpha_i, \beta_i \text{ from UNIDO production data; UN National Accounts data} \]

\[ \gamma \text{ OECD input output table for USA} \]
 Calibration and Computation
Putting numbers on parameters

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  - $\theta = 8.28$ Eaton and Kortum (2002)
Calibration and Computation

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  - $\theta = 8.28$ Eaton and Kortum (2002)
  - $\theta = 3.60$ Bernard, Eaton, Kortum, and Jensen (2003)
- $\alpha_i, \beta_i$ from UNIDO production data; UN National Accounts data
- $\gamma$ OECD input output table for USA
Reformulate Equilibrium Conditions in terms of changes in GDP, value added, and trade shares from current values.
Immobile labor 1: mftr labor market equilibrium

\[ \hat{w}_i^M \frac{V_i^M}{\beta_i} = \sum_{n=1}^{N} \pi'_{ni} \left( \hat{w}_n^M \frac{V_n^M}{\beta_n} + D_i^{Mf} \right) \]
non-mftr labor market equilibrium:

\[
\hat{w}_n^N v_n^N = \left[ \frac{1 - \alpha_n}{\alpha_n} + \gamma \left( 1 - \beta_n \right) \right] \hat{w}_n^M v_n^M + \frac{1}{\alpha_n} D_n^{M'} - D'_n
\]
trade shares:

\[
\pi'_{ni} = \frac{\pi_{ni} \left[ (\hat{w}^M_i)^{\beta_i} (\hat{w}^N_i) \gamma(1-\beta_i) \hat{p}_i(1-\gamma)(1-\beta_i)^{\beta_i} \right]^{-\theta}}{\sum_{k=1}^{N} \pi_{nk} \left[ (\hat{w}^M_k)^{\beta_k} (\hat{w}^N_k) \gamma(1-\beta_k) \hat{p}_k(1-\gamma)(1-\beta_k)^{\beta_k} \right]^{-\theta}}
\]
Immobile labor 4: price indices

- price index:

\[
\hat{p}_n = \left( \sum_{i=1}^{N} \pi_{ni} \left[ \left( \hat{w}_i^M \right)^{\beta_i} \left( \hat{w}_i^N \right)^{\gamma(1-\beta_i)} \hat{p}_i^{(1-\gamma)(1-\beta_i)} \right]^{-\theta} \right)^{-1/\theta}.
\]
Similar, only with total GDP rather than sectoral value added
Set $D_i^{M'} = D_i^M + CA_i$ for each country, fixing $D_i^O$
RESULTS
TABLE 2: Exchange Rate Changes Associated with Eliminating Current Accounts
(Immobile and mobile labor)

<table>
<thead>
<tr>
<th>Country</th>
<th>CA Deficit (% of GDP)</th>
<th>Exchange Rate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>immobile</td>
</tr>
<tr>
<td>CANADA</td>
<td>-2.27</td>
<td>1.031</td>
</tr>
<tr>
<td>CHINA/HK</td>
<td>-4.14</td>
<td>1.037</td>
</tr>
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<td>DENMARK</td>
<td>-2.56</td>
<td>1.105</td>
</tr>
<tr>
<td>GERMANY</td>
<td>-3.85</td>
<td>1.073</td>
</tr>
<tr>
<td>ISRAEL</td>
<td>-2.72</td>
<td>1.064</td>
</tr>
<tr>
<td>JAPAN</td>
<td>-3.89</td>
<td>1.093</td>
</tr>
<tr>
<td>UNITED STATES</td>
<td>5.55</td>
<td>0.859</td>
</tr>
<tr>
<td>Country</td>
<td>Immobile Labor real wage change</td>
<td>Mobile Labor change in mfg employment shr</td>
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<tr>
<td>--------------</td>
<td>---------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>mfg</td>
<td>non-mfg</td>
</tr>
<tr>
<td>CANADA</td>
<td>0.948</td>
<td>1.013</td>
</tr>
<tr>
<td>CHINA/HK</td>
<td>0.989</td>
<td>1.007</td>
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<td>DENMARK</td>
<td>0.922</td>
<td>1.016</td>
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<td>GERMANY</td>
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<td>1.017</td>
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<td>ISRAEL</td>
<td>0.922</td>
<td>1.012</td>
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<td>JAPAN</td>
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<td>1.020</td>
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<tr>
<td>UNITED STATES</td>
<td>1.231</td>
<td>0.960</td>
</tr>
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</table>
TABLE 4: Changes in Real Exchange Rates Associated with Eliminating Current Accounts
(Immobile and Mobile Labor and Alternative Lower Trade Elasticity)

<table>
<thead>
<tr>
<th>Country</th>
<th>Change in the Real Exchange Rate</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>high trade elasticity</td>
<td>immobile</td>
<td>mobile</td>
<td>low trade elasticity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>immobile</td>
<td>mobile</td>
<td>immobile</td>
</tr>
<tr>
<td>CANADA</td>
<td>1.002</td>
<td>1.003</td>
<td></td>
<td>1.002</td>
</tr>
<tr>
<td>CHINA/HK</td>
<td>1.000</td>
<td>1.000</td>
<td></td>
<td>1.000</td>
</tr>
<tr>
<td>DENMARK</td>
<td>1.005</td>
<td>1.003</td>
<td></td>
<td>1.007</td>
</tr>
<tr>
<td>GERMANY</td>
<td>1.000</td>
<td>1.002</td>
<td></td>
<td>1.002</td>
</tr>
<tr>
<td>ISRAEL</td>
<td>1.000</td>
<td>1.001</td>
<td></td>
<td>0.999</td>
</tr>
<tr>
<td>JAPAN</td>
<td>0.999</td>
<td>1.002</td>
<td></td>
<td>1.001</td>
</tr>
<tr>
<td>UNITED STATES</td>
<td>0.995</td>
<td>0.996</td>
<td></td>
<td>0.991</td>
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</table>
TABLE 5: CHANGES IN REAL WAGES, REAL GDP, OVERALL PRICE INDEX, AND REAL ABSORPTION (FACTOR IMMOBILITY)

<table>
<thead>
<tr>
<th>country</th>
<th>real wages</th>
<th>real aggregate</th>
<th>real absorption</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mfg</td>
<td>non-mfg</td>
<td>GDP</td>
</tr>
<tr>
<td>ALGERIA</td>
<td>0.760</td>
<td>1.075</td>
<td>1.058</td>
</tr>
<tr>
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Figure 1

Change in exchange rate vs. current account deficit as a percentage of GDP.
Lessons

Large changes in relative GDPs and hence nominal exchange rates with immobile labor
Lessons

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2. Smaller with labor mobility
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2. Smaller with labor mobility
3. The pull of gravity of large economies on the small (Canada vs. Denmark)
4. With Immobile labor there are large redistributions toward mftr labor in deficit countries, with the reverse in surplus countries
5. In either case overall real wages and real exchange rates change very little
What’s next?

1. Model trade in nonmanufactures
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2. Nail down determinants of factor mobility to connect the two cases
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1. Model trade in nonmanufactures
2. Nail down determinants of factor mobility to connect the two cases
3. Embed in a model that explains the reasons for current account imbalances