



## Unbalanced Trade

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Presentation given at the 8th Jacques Polak Annual Research Conference  
Hosted by the International Monetary Fund  
Washington, DC—November 15-16, 2007  
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# Global Rebalancing with Gravity: How Big is the Burden of Adjustment?

Robert Dekle, Jonathan Eaton, and Samuel Kortum

15 November 2007

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

TABLE 1: GDP AND DEFICIT MEASURES, 2004

country	GDP	Deficits		
		CA	Trade	Manuf.
ALGERIA	85	-11.2	-7.2	13.2
ARGENTINA	153	-3.6	-11.0	10.3
AUSTRALIA	659	39.2	21.8	60.3
AUSTRIA	293	-1.2	-4.4	1.1
BELGIUM/LUXEM	392	-16.6	-20.5	54.5
BRAZIL	604	-12.5	-26.1	-5.8
CANADA	992	-22.5	-35.7	26.9
CHILE	96	-1.7	-8.1	1.9
CHINA/HK	2106	-87.2	-54.0	-121.8
COLOMBIA	98	0.8	0.8	8.4
DENMARK	245	-6.3	-11.3	9.5
EGYPT	82	-4.0	0.8	1.2
FINLAND	189	-9.9	-9.6	-14.4
FRANCE	2060	4.1	7.4	5.3
GERMANY	2740	-105.4	-122.9	-209.5
GREECE	264	13.1	13.9	29.5
INDIA	689	-7.8	14.5	-5.4
INDONESIA	254	-1.9	-10.1	-20.8
IRELAND	183	0.8	-25.5	-66.2
ISRAEL	122	-3.3	0.1	0.7
ITALY	1720	13.4	-4.0	-21.2
JAPAN	4580	-178.1	-72.4	-277.0
KOREA	680	-29.1	-26.3	-82.1
MALAYSIA	118	-15.0	-24.6	-33.3
MEXICO	683	5.8	17.8	22.0
NETHERLANDS	608	-55.2	-44.4	9.2
NEW ZEALAND	98	6.3	1.1	11.0
NORWAY	255	-35.1	-34.9	16.4
PAKISTAN	113	0.7	6.5	0.4
PERU	70	-0.1	-1.6	2.7
PHILIPPINES	87	-1.7	7.9	-13.5
PORTUGAL	178	12.7	14.3	10.7
RUSSIA	592	-59.4	-69.6	-7.7
SINGAPORE	107	-26.5	-29.2	42.5
SOUTH AFRICA	216	7.2	2.6	2.9
SPAIN	1040	53.5	44.8	62.8
SWEDEN	349	-27.9	-27.4	-23.2
SWITZERLAND	360	-57.1	-32.8	-9.5
THAILAND	161	-7.1	-6.0	-7.9
TURKEY	302	15.2	12.5	18.7
UNITED KINGDOM	2150	32.3	74.2	109.2
UNITED STATES	11700	649.7	667.0	484.6
VENEZUELA	112	-14.0	-17.3	6.2
REST OF WORLD	3025	-53.4	-171.3	-102.6

(US\$ billions)

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- 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

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

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  - 3 world regions

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  - 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

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

$$Y_i^M = X_i^M - D_i^M$$

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- $\gamma$  share of non-mftr in mftr intermediates

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## 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):

$$p_{ni} = \frac{d_{ni} c_i}{z_i(j)}$$

# Our framework

## Model Ingredients II

- Distribution for  $z$ :

$$F(z) = e^{-T_i z^{-\theta}}$$

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- Distribution for  $z$ :

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



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## 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)

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- World Manufacturing Equilibrium:

$$Y_i^M = \sum_{n=1}^N \pi_{ni} X_i^M$$

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- Factor rewards  $w_i^M$  and  $w_i^N$
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- $c_i = \kappa_i w_i^{\beta_i + \gamma(1-\beta_i)} p_i^{(1-\gamma)(1-\beta_i)}$

- Forty four countries in 2004

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Putting numbers on parameters

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- $\alpha_i, \beta_i$  from UNIDO production data; UN National Accounts data
- $\gamma$  OECD input output table for USA

# Calibration and Computation

## Technology and Geographic Barriers

- Reformulate Equilibrium Conditions in terms of *changes* in GDP, value added, and trade shares from current values

# Calibration and Computation

## Immobile labor 1: mftr labor market equilibrium

- mftr labor market equilibrium:

$$\hat{w}_i^M \frac{V_i^M}{\beta_i} = \sum_{n=1}^N \pi'_{ni} \left( \hat{w}_n^M \frac{V_n^M}{\beta_n} + D_i^{M'} \right)$$

# Calibration and Computation

## Immobile labor 2: non-mftr labor market equilibrium

- non-mftr labor market equilibrium:

$$\widehat{w}_n^N V_n^N = \left[ \frac{1 - \alpha_n}{\alpha_n} + \frac{\gamma(1 - \beta_n)}{\alpha_n \beta_n} \right] \widehat{w}_n^M V_n^M + \frac{1}{\alpha_n} D_n^{M'} - D_n'$$

# Calibration and Computation

## Immobile labor 3: trade shares

- trade shares:

$$\pi'_{ni} = \frac{\pi_{ni} \left[ (\widehat{w}_i^M)^{\beta_i} (\widehat{w}_i^N)^{\gamma(1-\beta_i)} \widehat{p}_i^{(1-\gamma)(1-\beta_i)} \right]^{-\theta}}{\sum_{k=1}^N \pi_{nk} \left[ (\widehat{w}_k^M)^{\beta_k} (\widehat{w}_k^N)^{\gamma(1-\beta_k)} \widehat{p}_k^{(1-\gamma)(1-\beta_k)} \right]^{-\theta}}$$

# Calibration and Computation

## Immobile labor 4: price indices

- price index:

$$\hat{p}_n = \left( \sum_{i=1}^N \pi_{ni} \left[ (\hat{w}_i^M)^{\beta_i} (\hat{w}_i^N)^{\gamma(1-\beta_i)} \hat{p}_i^{(1-\gamma)(1-\beta_i)} \right]^{-\theta} \right)^{-1/\theta} .$$

- Similar, only with total GDP rather than sectoral value added



# Calibration and Quantification

## Counterfactual experiment

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)

Country	CA Deficit (% of GDP)	Exchange Rate Change	
		immobile	mobile
CANADA	-2.27	1.031	0.989
CHINA/HK	-4.14	1.037	1.016
DENMARK	-2.56	1.105	1.034
GERMANY	-3.85	1.073	1.026
ISRAEL	-2.72	1.064	1.010
JAPAN	-3.89	1.093	1.035
UNITED STATES	5.55	0.859	0.954

TABLE 3: Sectoral Changes Associated with Eliminating Current Accounts  
(Immobile and Mobile Labor)

Country	Immobile Labor real wage change		Mobile Labor change in mfg employment shr
	mfg	non-mfg	
CANADA	0.948	1.013	0.943
CHINA/HK	0.989	1.007	0.988
DENMARK	0.922	1.016	0.901
GERMANY	0.932	1.017	0.934
ISRAEL	0.922	1.012	0.920
JAPAN	0.922	1.020	0.925
UNITED STATES	1.231	0.960	1.226

TABLE 4: Changes in Real Exchange Rates Associated with Eliminating Current Accounts  
(Immobile and Mobile Labor and Alternative Lower Trade Elasticity)

Country	Change in the Real Exchange Rate			
	high trade elasticity		low trade elasticity	
	immobile	mobile	immobile	mobile
CANADA	1.002	1.003	1.002	1.005
CHINA/HK	1.000	1.000	1.000	1.000
DENMARK	1.005	1.003	1.007	1.005
GERMANY	1.000	1.002	1.002	1.005
ISRAEL	1.000	1.001	0.999	1.001
JAPAN	0.999	1.002	1.001	1.004
UNITED STATES	0.995	0.996	0.991	0.991

TABLE 5: CHANGES IN REAL WAGES, REAL GDP, OVERALL PRICE INDEX, AND REAL ABSORPTION  
(FACTOR IMMOBILITY)

country	real wages		real GDP	aggregate price index	real absorption
	mfg	non-mfg			
ALGERIA	0.760	1.075	1.058	1.282	1.197
ARGENTINA	0.983	1.010	1.004	1.045	1.032
AUSTRALIA	1.191	0.961	0.986	0.890	0.926
AUSTRIA	0.992	1.002	1.000	1.040	1.005
BELGIUM/LUXEM	0.959	1.017	1.008	1.051	1.054
BRAZIL	0.955	1.014	1.001	1.066	1.025
CANADA	0.948	1.013	1.002	1.029	1.026
CHILE	0.962	1.011	1.003	1.053	1.027
CHINA/HK	0.989	1.007	1.000	1.037	1.042
COLOMBIA	1.019	0.996	0.999	1.010	0.991
DENMARK	0.922	1.016	1.005	1.099	1.034
EGYPT	0.937	1.019	1.004	1.092	1.048
FINLAND	0.906	1.024	1.000	1.099	1.056
FRANCE	1.004	0.999	1.000	1.029	0.998
GERMANY	0.932	1.017	1.000	1.073	1.041
GREECE	1.177	0.969	0.986	0.918	0.939
INDIA	0.983	1.003	1.000	1.039	1.010
INDONESIA	0.988	1.004	1.000	1.040	1.009
IRELAND	1.019	0.999	1.004	1.015	1.002
ISRAEL	0.922	1.012	1.000	1.064	1.026
ITALY	1.013	0.997	0.999	1.024	0.992
JAPAN	0.922	1.020	0.999	1.094	1.037
KOREA	0.921	1.022	0.996	1.081	1.040
MALAYSIA	0.925	1.036	1.001	1.055	1.168
MEXICO	1.014	0.994	0.997	0.987	0.989
NETHERLANDS	0.826	1.042	1.015	1.134	1.111
NEW ZEALAND	1.106	0.967	0.987	0.940	0.921
NORWAY	0.763	1.067	1.037	1.238	1.201
PAKISTAN	1.012	0.997	0.999	1.014	0.993
PERU	0.996	1.001	1.000	1.021	1.002
PHILIPPINES	0.937	1.013	0.995	1.075	1.007
PORTUGAL	1.163	0.968	0.994	0.947	0.929
RUSSIA	0.804	1.054	1.015	1.230	1.134
SINGAPORE	1.060	0.891	0.936	1.064	1.254
SOUTH AFRICA	1.061	0.985	0.998	0.990	0.965
SPAIN	1.096	0.977	0.995	0.976	0.945
SWEDEN	0.826	1.040	1.002	1.159	1.089
SWITZERLAND	0.733	1.085	1.020	1.250	1.182
THAILAND	0.964	1.019	1.000	1.051	1.045
TURKEY	1.081	0.973	0.995	0.981	0.946
UNITED KINGDOM	1.038	0.992	0.998	1.006	0.983
UNITED STATES	1.231	0.960	0.995	0.863	0.943
VENEZUELA	0.833	1.076	1.036	1.221	1.197
REST OF WORLD	0.953	1.009	1.000	1.062	1.022

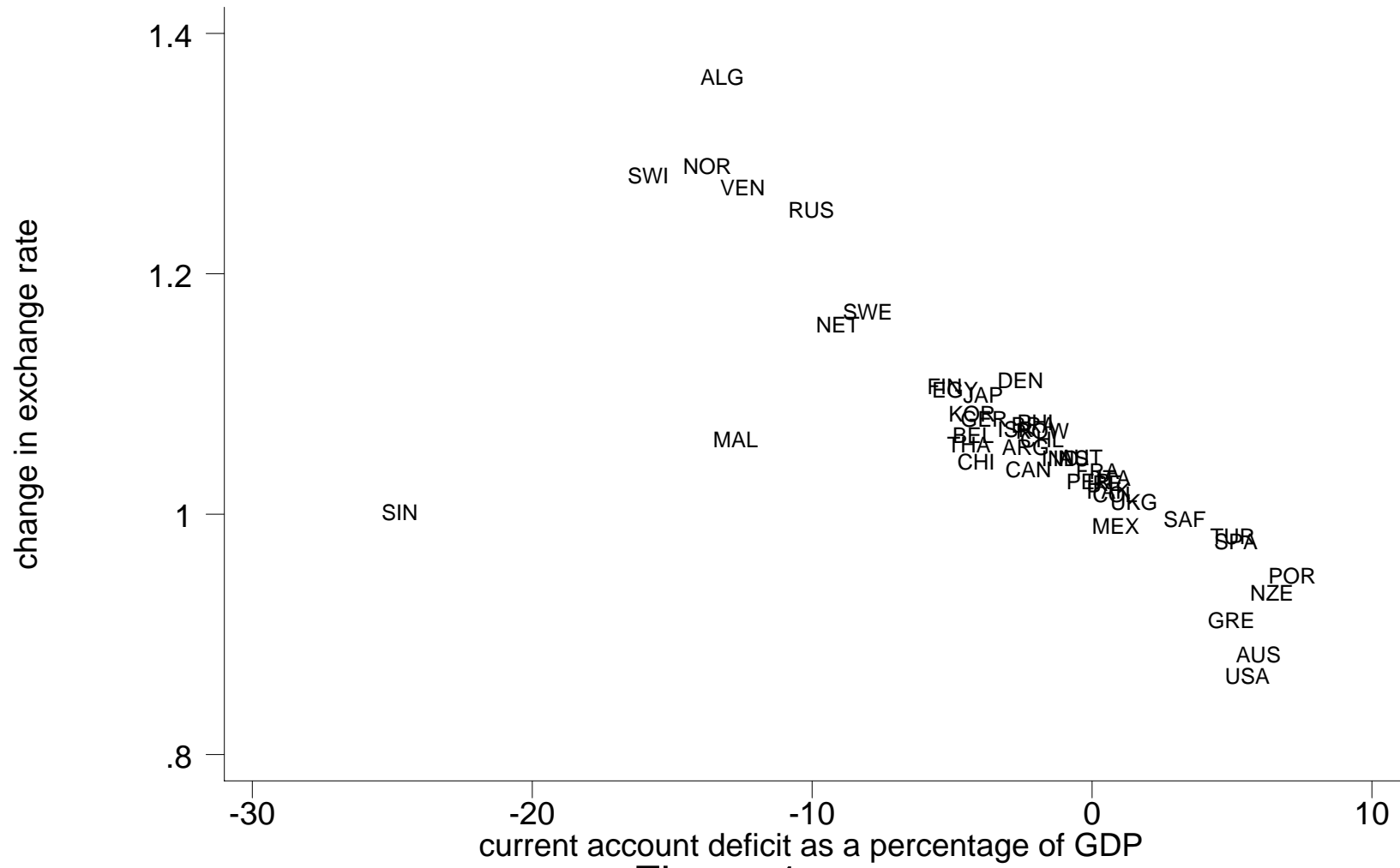


Figure 1

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



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- 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?

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- 3 Embed in a model that explains the reasons for current account imbalances