

# Trade Reforms and Current Account Imbalances

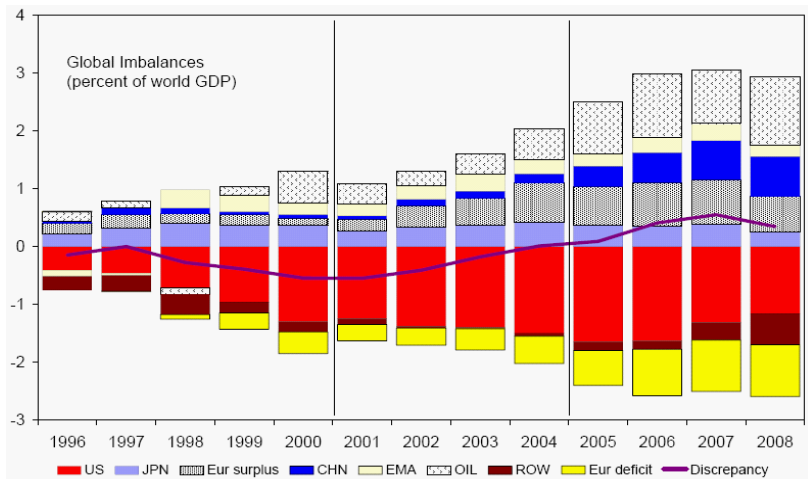
Jiandong Ju, Kang Shi, Shang-jin Wei

Tsinghua University  
Chinese University of Hong Kong  
Columbia University and NBER

September 2018

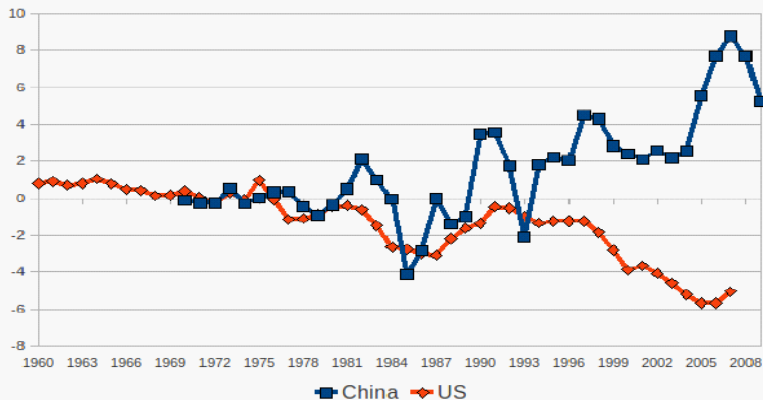
- Global current account imbalances have attracted attention in both the academic and policy worlds.
- Notable features include:
  - A surge in China's current account surplus from a modest 2% of GDP in 2002 to over 10% in 2007;
  - A surge in the US current account deficit from about 3% to about 7% during the same period.
  - Anxiety and calls for measure to "correct" the imbalances.
- "Global imbalance" or "capital allocation puzzle"

# Global imbalance: 1996-2008



# Trade surplus: the US vs China

Trade Surplus Over GDP, %



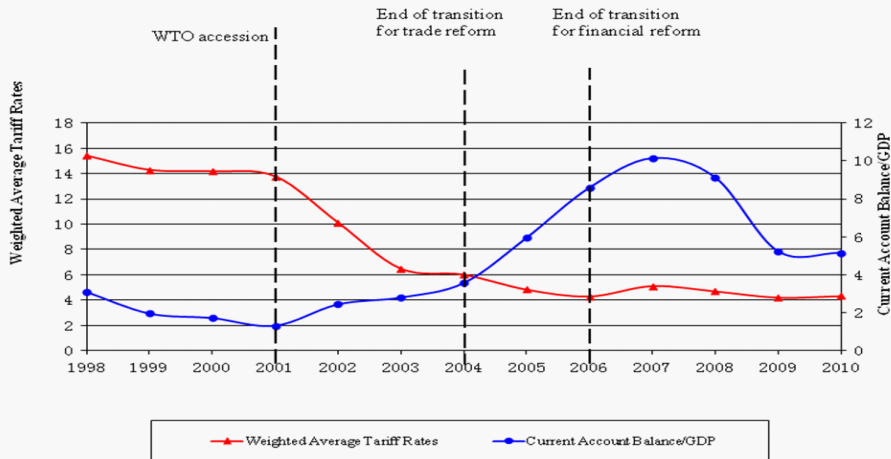
- During the same period, a wave of trade reforms have taken place around the world and international trade increased substantially.
- Three are especially noteworthy:
  - China's accession to the WTO in December 2001 (Wei and Tang, 2001)
  - Phasing out of the textile and garment import quotas in the United States in 2001 and 2005 (Khandelwal, Schott, and Wei, 2013)
  - Permanent Normal Trading Relationship granted by the US to China in 2000 (Pierce and Schott, 2016)

# Tariff reduction and trade increase in the world

- At the same time, trade openness measured by  $(\text{imports} + \text{exports})/\text{GDP}$  developing countries has increased from about 20% in 1990 to more than 40%;
- The average tariff rate in developing countries has declined from about 60% to 15%.

# Trade reform in China: 1998-2010

**Weighted Average Tariff Rates and Current Account Balance/GDP  
China 1998-2010**



# The end of Multifibre Arrangement (MFA)

- The Multifibre Arrangement (MFA) governed the world trade in textiles and garments from 1974 through 2004, imposing quotas on the amount developing countries could export to certain developed countries including the United States. Its end was spelt out on 1 January 2005.
- All textile and garment quotas on imports from China expired on January 1, 2005. From 2004 to 2005, the textile and clothing exports from China to the West grew by 100% or more in many items, indicating how restrictive the quotas were previously.
- Citing a temporary safeguard in China's WTO accession agreement, the US re-introduced quotas that restrict the growth of textile and garment imports from China to 7.5%/year from 2006-2008. (The EU reached an agreement with China and restricted the growth of imports from China in this sector to 10% a year during 2006-2008.)



# Question?

- Are the developments of global imbalances and trade reforms connected?
- Would efficient trade liberalization contribute to global current account imbalances?

# Traditional Wisdom:

- If import barriers are reduced, the country's imports must go up.
- If foreign trade policies are unchanged, this must result in a reduction in the trade surplus and a reduction in its current account surplus.
- That is, trade reform can reduce current account surplus.

# This could be wrong!

- The traditional argument is a partial equilibrium thinking!
- The general equilibrium effect would overturn this: an export expansion triggered by trade liberalization would more than offset the increase in imports, such that the country's current account surplus would go up, not down.

# Why?

- Important to realize trade reforms mean different things for a developing country like China versus a developed country like the United States.
- For a developing country, the import barriers (before the trade liberalization) are largely on capital-intensive goods (e.g., machine manufacturing).
- A reduction in the import barriers would lead to an increase in the imports of capital intensive goods, and a contraction of the domestic capital intensive sector.

# The Stolper-Samuelson effect

- A reduction in the domestic price of the capital intensive good,
- -> A reduction in the domestic interest rate ( return to capital)
- -> Incentive for domestic capital to leave for the foreign country
- -> capital outflow = current account surplus .

# What does this paper do?

- We will show a general equilibrium effect rigorously in a dynamic general equilibrium model with HO structure (Heckscher–Ohlin model), which has both goods trade and capital flows.
- Our results show that, instead of being driven by underlying distortions in an economy, current account imbalances can arise as an equilibrium response to welfare-improving trade reforms, but the response of current account to trade reform also depends on factor market reform.
- We explore the role of major trade reforms (not just the WTO accession in China but also the end of MFA in the US) in the global current account patterns, something not having been pursued in the literature. Our theory complements others in the literature.

# Three contributions

- Solving the technical problem of interest rate over determination in a dynamic H-O model.(Stiglitz 1970)
- Revising the traditional wisdom that reducing import barriers by a surplus country can reduce trade or current account imbalance.
- Providing a new view on the experiences of the Chinese and US current account balances of the last two decades.

- Current account imbalances
  - Financial development (Caballero, Farhi, Gourinchas, 2009; Mendoza, Quadrini, and Rios-Rull, 2009; Song, Storesletten and Zilibotti, AER2011, Ju and Wei, JIE 2010)
  - Sex Ratio Imbalance (Wei and Zhang, JPE 2011; Du and Wei, JIE 2014)



## Related Literature(2)

- Trade reforms and capital flows
  - Antras and Caballero, JPE 2009), Reyes-Heroles (2015), Alessandria, Choi and Lu (2016)
- HO model and DSGE:
  - Cunat and Maffezzoli (2004), Ju and Wei (2007), Jin (AER2012), and Ju, Shi and Wei (2014)
- Endogenous Time Discount:
  - Uzawa (1968), Mendoza (1991), Uribe (1997), Schmitt-Grohe (1998), Schmitt-Grohe and Uribe (2003) and Choi, Mark and Sul (2008)

# What about cross-country patterns beyond China?

- Our paper uses China and the U.S. as a motivating example, but the logic applies to all countries.
- Look at major trade reform episodes since 1990,
- Check if
- reform episodes in which a country's capital intensity declines tend to exhibit an improvement in its current account, and
- reform episodes in which a country's capital intensity increases tend to exhibit a deterioration in its current account.

# Identifying trade reform episodes

- An episode is defined as a major trade reform if it satisfies two criteria simultaneously.
- A significant reduction in the average tariff rate
  - Either simple average or trade weighted average
  - Over 1-3 years
  - At least by 3 percentage points
- A significant increase in import/GDP ratio
  - Over 1-3 years
  - At least by 3 percentage points.

# Episodes of trade reforms

**Table 1: Episodes of Trade Reforms (1990-2010)**

Country Name	Period	Tariff Change		Imports Change
		(Simple Average)	(Weighted Average)	
Albania*	2001-2002	-3.21	-2.93	8.01
Algeria*	2001-2003	-3.44	-3.19	3.8
Bangladesh*	2003-2005	-4.21	0.86	3.01
Bangladesh	2006-2007	-0.72	-8.62	3.51
Belize	1999-2001	-9.18	-0.48	6.31
Bhutan	2005-2007	-0.24	-5.01	4.27
Brazil*	1989-1993	-30.01	-18.9	3.63
Brazil*	1998-2001	-1.76	-5.52	4.56
Cambodia*	2003-2005	-2.14	-5.54	4.35
Canada*	1995-1997	-3.3	-2.34	3.4
China*	1992-1997	-24.57	-16.35	4.86
China*	2001-2003	-4.52	-7.63	6.88
Georgia*	2002-2004	-3.1	-1.33	4.02
Guyana	1999-2001	-9.73	-3.59	6.14
India*	2004-2008	-16.86	-16.55	4.93
Indonesia*	1989-1990	-3.48	0.36	3.55

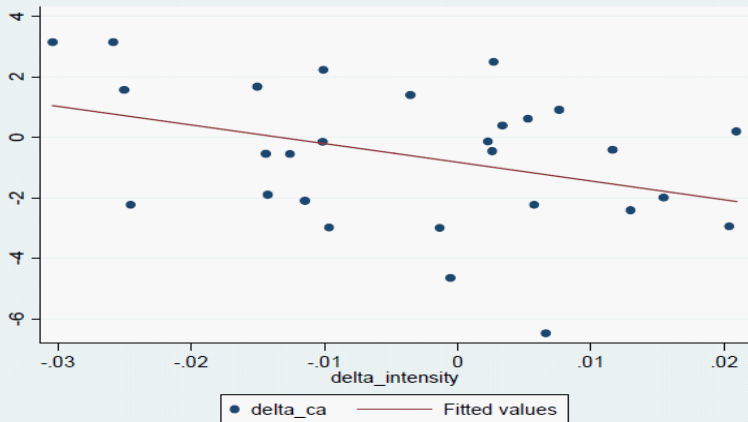
# Episodes of trade reform(cont.)

Indonesia*	1999-2001	-4.3	-1.74	3.03
Kenya*	2004-2006	-4.11	-3.44	3.1
Kyrgyz Republic*	2002-2003	-3.33	-2.52	7.92
Lebanon	2000-2001	-8.72	-8.69	4.01
Lesotho	2006-2007	0.05	-3.04	5.22
Malawi*	1996-1998	-6.67	-4.37	6.23
Mauritius*	1995-1997	-0.99	-4.91	3.19
Mauritius*	2005-2006	-2.96	-3.5	7.05
Morocco*	2006-2009	-6.13	-4.61	5.19
Nigeria*	2001-2002	3.9	-3.02	8.15
Pakistan	2001-2003	-3.01	-3.43	3.85
Paraguay*	2004-2006	-1.91	-5.21	5.6
Peru*	2006-2008	-4.11	-4.04	7.23
Philippines	1989-1990	-8.68	-7.66	3.02
Seychelles*	2005-2006	-3.64	-0.45	4.13
St Lucia*	2000-2001	-9.76	-4.25	4.16
Syrian Arab Republic	2009-2010	0	-4.03	4.61
Thailand*	1993-1995	-22.66	-21.7	6.39
Thailand*	2003-2005	-3.46	-4.15	6.94
Tunisia*	2002-2008	-12.4	-10.46	3.36
Zimbabwe	1996-2003	-25.1	-22.45	8.67

# Determining change in capital intensity

- Assigning a capital-labor ratio to each HS-6 sector based on the 2002 US Input-Output Table
- Assuming the same ratio applies to all countries
- For a given country, (e.g., China), we know the change in export composition from before to after the trade reform.
- This allows one to compute changes in capital intensity (in export structure)

Figure 2: Scatter Plot of Delta CA/GDP vs Delta k-intensity (from t-1 to t+1): Major Trade Policy Changes around the World (1990-2010)



**Table 2: Changes in Current Account and Changes in Trade Policy, 1990-2010**

Dependent variable =  $\Delta$  (CA/GDP)

	(1)	(2)
$\Delta$ K-Intensity	-61.69* (30.26)	-139.77* (63.12)
$\Delta$ RER		-0.08* (0.04)
Constant	-0.82* (0.43)	-1.93** (0.77)
# of Observations	28	13

is significant at 10% level, \*\* 5% level, \*\*\* 1% level



- A negative relationship between a change in a country's capital intensity in exports and a change in its current account surplus.
- The evidence is suggestive not conclusive as the sample is small, we cannot have many control variables.
- This pattern has not been noticed in the literature.
- We will develop a theory in which this pattern can be explained.

# Basic ingredients of the model

- A small open economy
- The representative household: infinite horizon
- Production:
  - perfectly competitive intermediary good sectors: Sector 1 (labor-intensive) exports, and Sector 2 (capital-intensive) imports
  - 1 final good: produced by combining two intermediary goods.
- Costly change in a country's foreign asset position.
- There is a tariff on intermediary good 2. Trade liberalization means a reduction in the tariff on good 2.
- No financial frictions, but will introduce it later.

# Technical challenge

- In the standard intertemporal model, the interest rate in the steady state is determined by the time discount factor. In the HO model, the interest rate is determined by the zero profit conditions from the supply side. With a permanent shock such as a tariff cut, these two interest rates are not equal except by coincidence.
  - Our solution: introduce an endogenous discount factor modified after Uzawa. The interest rate is determined by the zero profit conditions in the HO model. Given the interest rate, through the endogenous discount factor, the total consumption in the steady state is then determined.
- When both goods trade and capital flows are allowed, there are multiple equilibria.
  - Our solution: i) introduce convex costs of capital flows, and ii) use the export/GDP ratio to select the equilibrium in the initial steady state.

# Model: Household (1)

- The household's utility is given by

$$U = \sum_{s=t}^{\infty} \theta_s U(C_s) \quad (1)$$

$$\begin{aligned} & P_t \left[ C_t + \frac{\psi_b}{2} (B_{t+1} - \bar{B})^2 \right] + B_{t+1} + I_t \\ = & w_t L + r_t K_t + (1 + r^*) B_t + TR_t \end{aligned} \quad (2)$$

$$K_{t+1} = (1 - \delta) K_t + I_t - \frac{1}{2} \psi_k \left( \frac{I_t}{K_t} - \delta \right)^2 K_t \quad (3)$$

- $\theta_{s+1} = \beta(\tilde{C}_s, \tilde{Y}_s) \theta_s$ ,  $s \geq 0$  the stochastic discount factor is endogenous, which depends on average consumption and output;

## Household (2)

- The household owns both factors of production, capital  $K$  and labor  $L$ . For simplicity, we assume a fixed labor supply.
- The household can hold foreign asset  $B_t$  to smooth consumption. We assume that trade in foreign bonds is subject to small and convex portfolio adjustment costs. If the household holds an amount  $B_{t+1}$ , then these portfolio adjustment costs, denominated in units of the final good, are  $\frac{\psi_b}{2}(B_{t+1} - \bar{B})^2$ , where  $\bar{B}$  is an exogenous capacity level of foreign asset management.

# Optimal conditions

The first order conditions with respect to  $C_t$ ,  $I_t$ ,  $K_{t+1}$ , and  $B_{t+1}$ , give intertemporal and intra-temporal optimization conditions

$$\frac{U'_c(C_t)}{P_t} = \Omega_t \quad (4)$$

$$\Lambda_t(1 - \psi_k(\frac{I_t}{K_t} - \delta)) = \Omega_t \quad (5)$$

$$\Lambda_t = \beta(\tilde{C}_t, \tilde{Y}_t) \left[ \Lambda_{t+1} \left( 1 - \delta + \frac{\psi_k}{2} \left( \frac{I_{t+1}}{K_{t+1}} - \delta \right) \left( \frac{I_{t+1}}{K_{t+1}} + \delta \right) \right) + \Omega_{t+1} r_{t+1} \right] \quad (6)$$

$$\Omega_t [1 + \psi_b P_t (B_{t+1} - \bar{B})] = \beta(\tilde{C}_t, \tilde{Y}_t) [\Omega_{t+1} (1 + r^*)] \quad (7)$$

- Final goods production function is  $D_t = G(D_{1t}, D_{2t})$ , where  $D_{it}$  is the usage of intermediate good  $i$ .
- The production function for the intermediate good  $i (= 1, 2)$  is  $X_{it} = f_i(A_{it}L_{it}, K_{it})$ ;  $D_{it}$  and  $X_{it}$  can differ due to international trade.
- The unit cost function for  $X_{it}$  is  $\phi_i(\frac{w_t}{A_{it}}, r_t)$ . Let  $P_i$  be the domestic price of intermediate good  $i$ . We assume that the country's endowment is always within the diversification cone so that both intermediate goods are produced.

$$P_{1t} = \phi_1\left(\frac{w_t}{A_{1t}}, r_t\right), P_{2t} = \phi_2\left(\frac{w_t}{A_{2t}}, r_t\right) \quad (8)$$

$$P_t D_t = P_t G(D_{1t}, D_{2t}) = P_{1t} D_{1t} + P_{2t} D_{2t} \quad (9)$$

# Equilibrium

- In equilibrium,

$$P_{1t} = P_{1t}^*, \quad P_{2t} = (1 + \tau)P_{2t}^*, \quad (10)$$

where  $P_{it}^*$  denotes the world price and is exogenously given, and  $\tau$  is the import tariff.

- We also have the following market clearing conditions in the home country

$$K_t = K_{1t} + K_{2t} \quad (11)$$

$$L_t = L_{1t} + L_{2t} \quad (12)$$

$$D_t = C_t + \frac{I_t}{P_t} + \frac{\psi_b}{2}(B_{t+1} - \bar{B})^2 \quad (13)$$

- The current account balance over period  $t$  is defined as  $CA_t = B_{t+1} - B_t$ , we can rewrite the budget constraint as

$$CA_t = P_{1t}^*(X_{1t} - D_{1t}) + P_{2t}^*(X_{2t} - D_{2t}) + r^*B_t \quad (14)$$



- $U(C_t) = \frac{C_t^{1-\gamma}}{1-\gamma}$
- $G(D_{1t}, D_{2t}) = \frac{1}{\omega^\omega(1-\omega)^{1-\omega}} D_{1t}^\omega D_{2t}^{1-\omega}$
- $f_i(A_{it}L_{it}, K_{it}) = \frac{1}{\alpha_i^{\alpha_i}(1-\alpha_i)^{1-\alpha_i}} K_{it}^{\alpha_i} (A_{it}L_{it})^{1-\alpha_i}$
- We assume an endogenous discount factor

$$\beta(\tilde{C}_t, \tilde{Y}_t) = \beta \left( \frac{\tilde{C}_t}{\bar{C}} \right)^{-\psi_1} \left( \frac{\tilde{Y}_t}{\bar{Y}} \right)^{\psi_2} \quad (15)$$

where  $\psi_1 > 0$  and  $\psi_2 > 0$ .  $\bar{C}$  and  $\bar{Y}$  are, respectively,

# Trade Liberalizations

- Stolper-Samuelson theorem:

① In a labor abundant country,  $\frac{\partial r}{\partial \tau_2} > 0$

② In a capital abundant country,  $\frac{\partial r}{\partial \tau_1} < 0$

- Recall

$$B = \frac{1}{\psi P} \frac{r^* - r + \delta}{1 + r - \delta}$$

- *Proposition 1: Trade liberalizations in a labor abundant country lead to a decrease in the return to capital in the country, which produces a current account surplus and results in an increase in the position of net foreign asset holding in the steady state. The opposite occurs when trade liberalizations take place in a capital abundant country.*

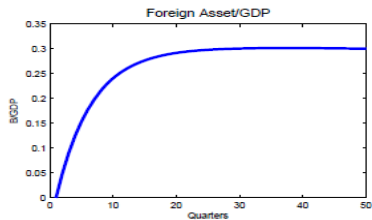
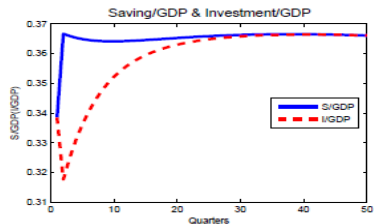
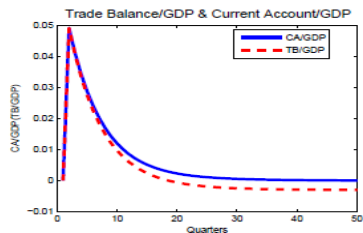
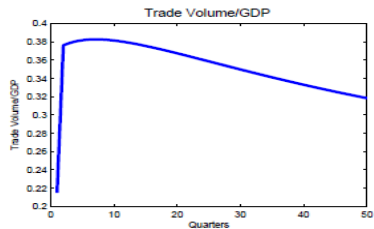
Table 3: Parameter Values in the Calibrations

$\beta$	discount factor in steady state	0.99
$\gamma$	inverse of the elasticity of intertemporal substitution	2
$\alpha_1$	capital share in sector 1	0.33
$\alpha_2$	capital share in sector 2	0.7
$\omega$	share of goods 1 in final good	0.5
$\psi_b$	coefficient for convex bond adjustment costs	0.0007
$\delta$	capital depreciation rate	0.025
$\psi$	parameter of endogenous discount factor	0.1
$\psi_k$	coefficient of capital adjustment cost	4
$A_1$	productivity in sector 1	0.8
$A_2$	productivity in sector 2	0.50207

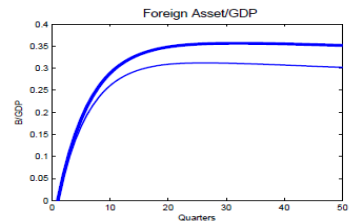
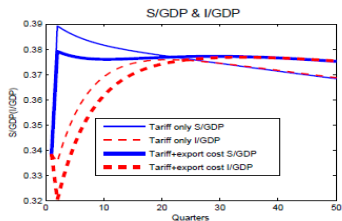
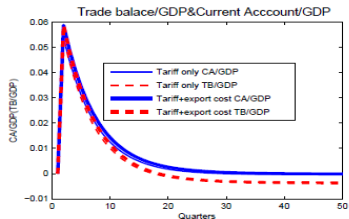
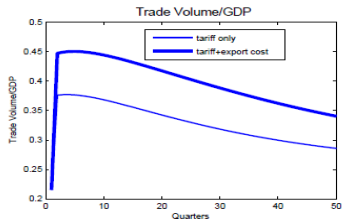
# Calibration (5% Tariff Cut): steady state

Variable	Benchmark ( 5% and 10% trariff reductions)		
	tariff=0.15	tariff=0.1	tariff=0.05
Asset/GDP	0.0%	27.3%	54.7%
Trade volume/GDP	21.5%	28.1%	38.9%
GDP	12.35	12.84	13.21
Consumption	8.36	8.46	8.47
C/Y	67.7%	65.9%	64.2%
I/PY	33.8%	35.7%	37.2%

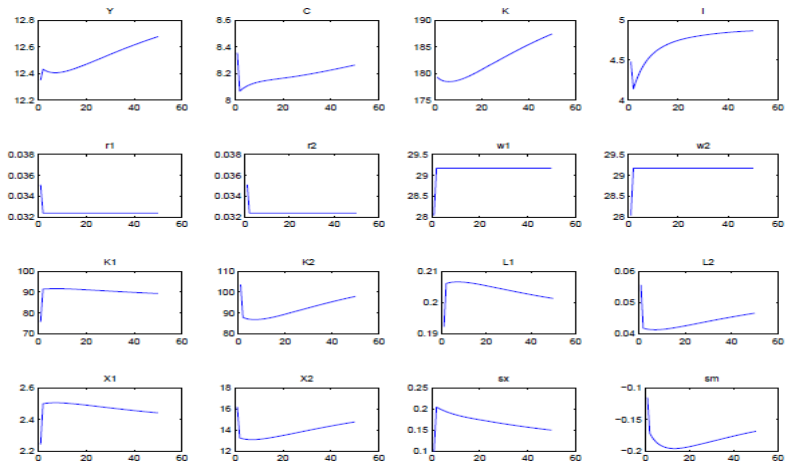
# Responses to a one-time 5 % cut in tariff



# Responses to 5 % tariff cut plus 2% export cost cut



# Transition path



- Factor market frictions could slow down structural adjustment and therefore reduce the CA effect of trade reforms. For this reason, factor market reforms could enhance the CA effect of trade reforms.
- The magnitude of capital outflow due to trade liberalizations by a poor country is significantly larger without financial frictions than with credit constraints.
- Example 1: financial sector reforms in China (2002-2007)



- Following Antras and Caballero (2009), we assume that financial frictions are asymmetric in two sectors.
- There are credit constraints in the exporting sector, but not importing sector.
- (i) each capitalist owns one unit of capital. Proportion  $\xi$  of  $K$  capitalists are endowed with “human capital” and are labelled as “entrepreneurs”. Only “entrepreneurs” know how to operate in the exporting sector. (ii) due to informational frictions, each entrepreneur can only borrow  $\theta$  amount of capital.

$$K_{1t} \leq (1 + \theta)\xi K_t = \mu K_t \quad (16)$$

# The budget constraint with credit constraints

- The budget constraint now becomes:

$$\begin{aligned} & P_t \left[ C_t + \frac{\psi}{2} (B_{t+1} - \bar{B})^2 \right] + B_{t+1} + I_t \\ = & w_t L + r_t^C K_t + (1 + r^*) B_t \end{aligned} \quad (17)$$

where

$$r_t^C = \mu r_{1t} + (1 - \mu) r_{2t}$$

# Financial frictions and capital flows

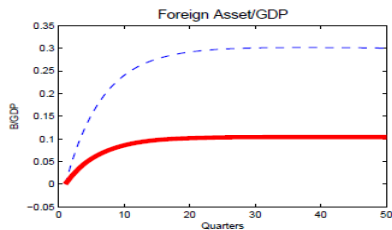
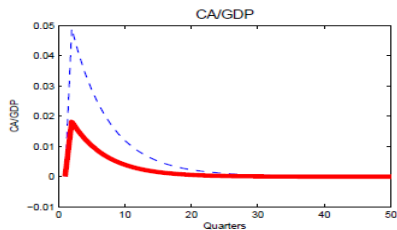
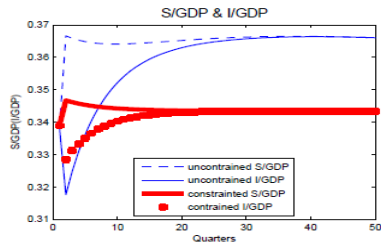
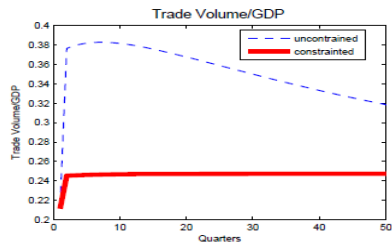
- The net foreign asset holding  $B$ .

$$B = \frac{1}{\psi P} \frac{r^* - r^C + \delta}{1 + r^C - \delta} \quad (18)$$

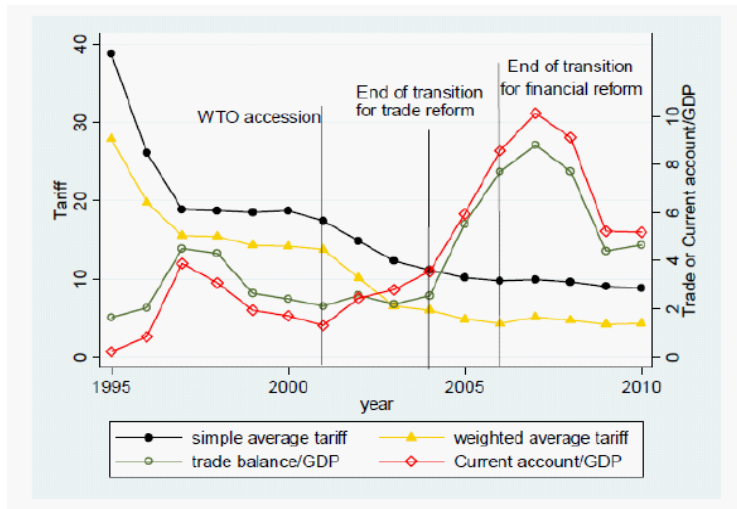
where  $r^C = \mu r_1 + (1 - \mu) r_2$ .

- The credit constraint reduces the capital usage in sector 1  $\Rightarrow r_1$  increases and  $w_1$  declines.
- $w_2 = w_1$  declines  $\Rightarrow P_2 = \phi_2(\frac{w_2}{A_2}, r_2) \Rightarrow r_2$  increases.
- $r^C$  increases  $\Rightarrow B$  declines (capital inflow)
- Supply side effect: Caballero, Farhi, and Gourinchas (2008), Mendoza, Quadrini, and Rios-Rull (2009), Ju and Wei (2010), and Song, Storesletten, and Zilibotti (2011): financial frictions reduce investors incentive in investing domestic projects, so capital flows out.
- Demand side effect: Antras and Caballero (2009) and this paper: credit constraints could increase firms' demand to capital, so capital flows in.

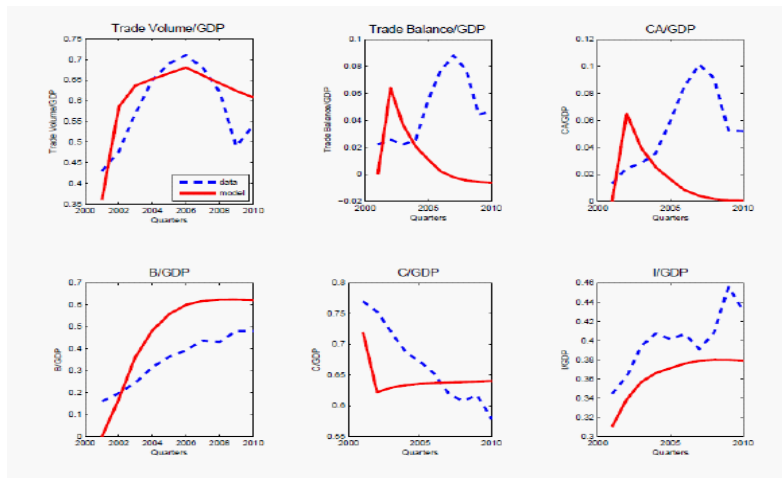
# Responses to tariff cut (5%) with vs without financial frictions



# Chinese Experience: 1995 vs 2001



# A simple quantitative analysis of China's WTO accession



# Concluding remarks (1)

- This paper develops a framework to study the effect of trade liberalizations on capital flows by embedding the HO model into the intertemporal model of current account.
- We show that trade liberalizations in a developing country lead to a current account surplus (capital outflow). Quantitatively, a moderate tariff reduction (5% tariff reduction) in the import competing (capital intensive) sector can lead to a cumulative increase of net foreign asset position on the order of 30 percent of GDP. The opposite happens when a rich country undertakes trade reforms.
- In this sense, (potentially efficient) trade liberalizations contribute to global current account imbalances.

## Concluding remarks (2)

- Factor market frictions can reduce the current account effect of trade reforms. Factor market reforms (reducing frictions) can enhance the CA effect of trade reforms.
- When financial frictions are asymmetric across sectors, we show that credit constraints (without trade liberalization) may cause capital to flow into a country. The credit constraint may significantly reduce the quantitative effect of trade liberalizations, although it does not alter the direction of capital flow.
- Trade reforms in combination with factor market reforms can produce even bigger current account imbalances
- Realistic trade and factor market reforms since 2001 could well be part of the story for the CA patterns.