

# The Global Impact of Chinese Growth

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# Facts and Motivation

- Facts on China's opening-up and growth:
  - China's openness jumped up in 1978 (10%→40%)
  - China's per capita GDP growth rate jumped up in 1978 (2.5%→nearly 8%)
  - China's trade balance was roughly zero, especially prior to 1978
- Question: How do China's opening-up and growth affect welfare in China and the rest of the world (ROW)?

# This Paper

- Two-country two-good model consisting of China and ROW
  - Backus, Kehoe, and Kydland (1994)
- Deduce shocks to China's "home goods weight" and productivity by matching data on China's openness and GDP growth
- Analyze effects of China's opening-up and growth on welfare in China and ROW
- Counterfactual simulation: case of no tariffs after 1978

# Effects of China's Opening-up and Growth on Welfare

- China's opening-up: welfare improving for China, little impact on ROW
  - China: imports more and produces less domestically (labor↓)
- China's productivity growth: welfare improving for both China and ROW
  - China: sustained increase in consumption
  - ROW: terms of trade improves → consumption↑
- Combination of China's opening-up and productivity growth: welfare improving for both China and ROW

# Effects of China's Opening-up and Growth on Welfare (ctd.)

- Counterfactual: Without balanced trade constraint, China's welfare would have been higher and ROW's welfare would have been lower
  - China: large wealth effects of expected future growth→consumes more by running trade deficit
  - ROW: works more to supply goods to China

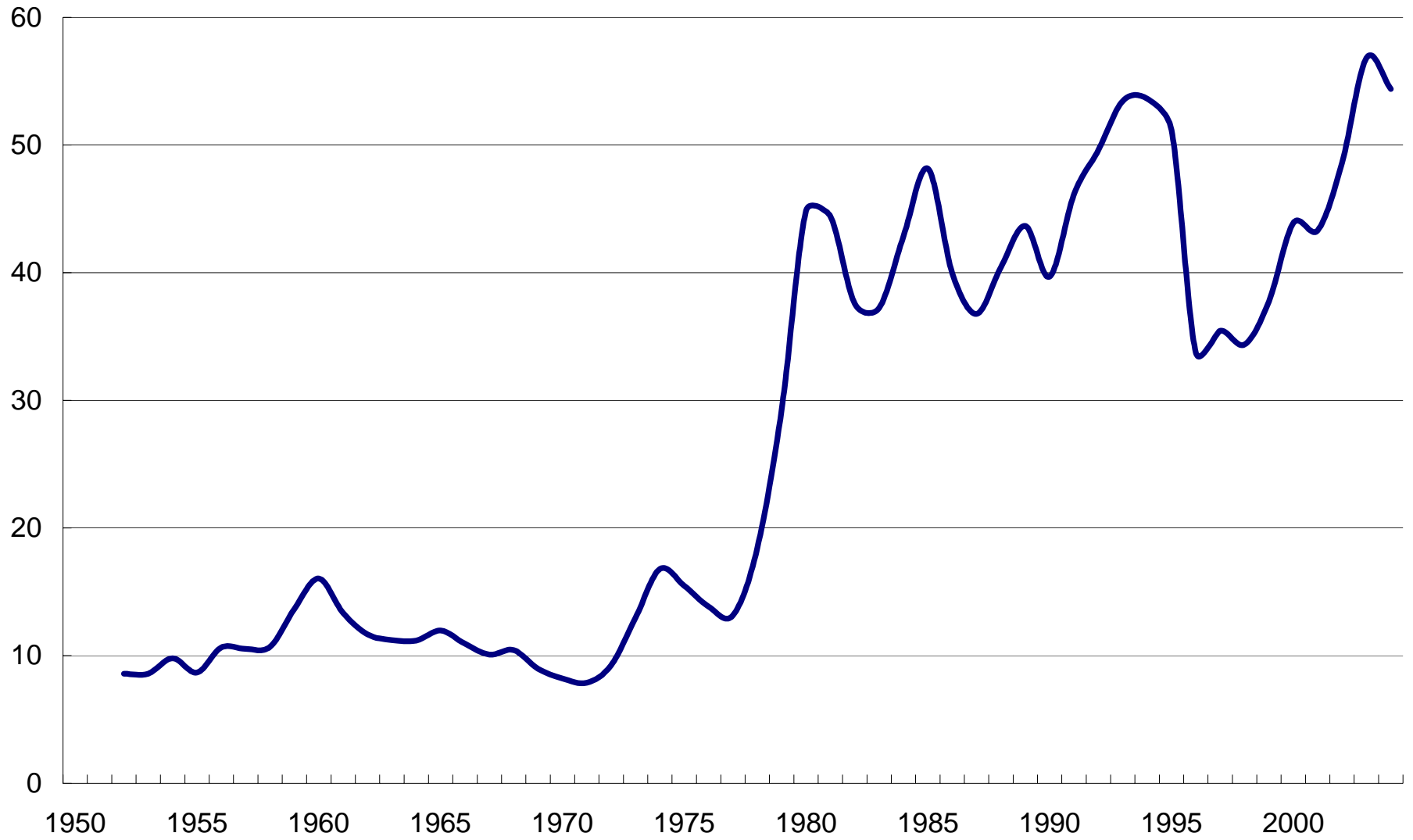
# Related Studies

- Dekle and Vandembroucke (2006): *Dynamic but closed model*
  - Shift in labor to private non-agriculture sector contributed to TFP growth in China
  - Importance of TFP in China's GDP growth
- Coleman (2007): *Open but static model*
  - Effects of China's opening-up on ROW
    - \* International production adjustment through changes in international relative prices
- This paper: *Dynamic and open model*
  - Enables us to consider combined effects of China's TFP growth and opening-up on both China and ROW

# Outline

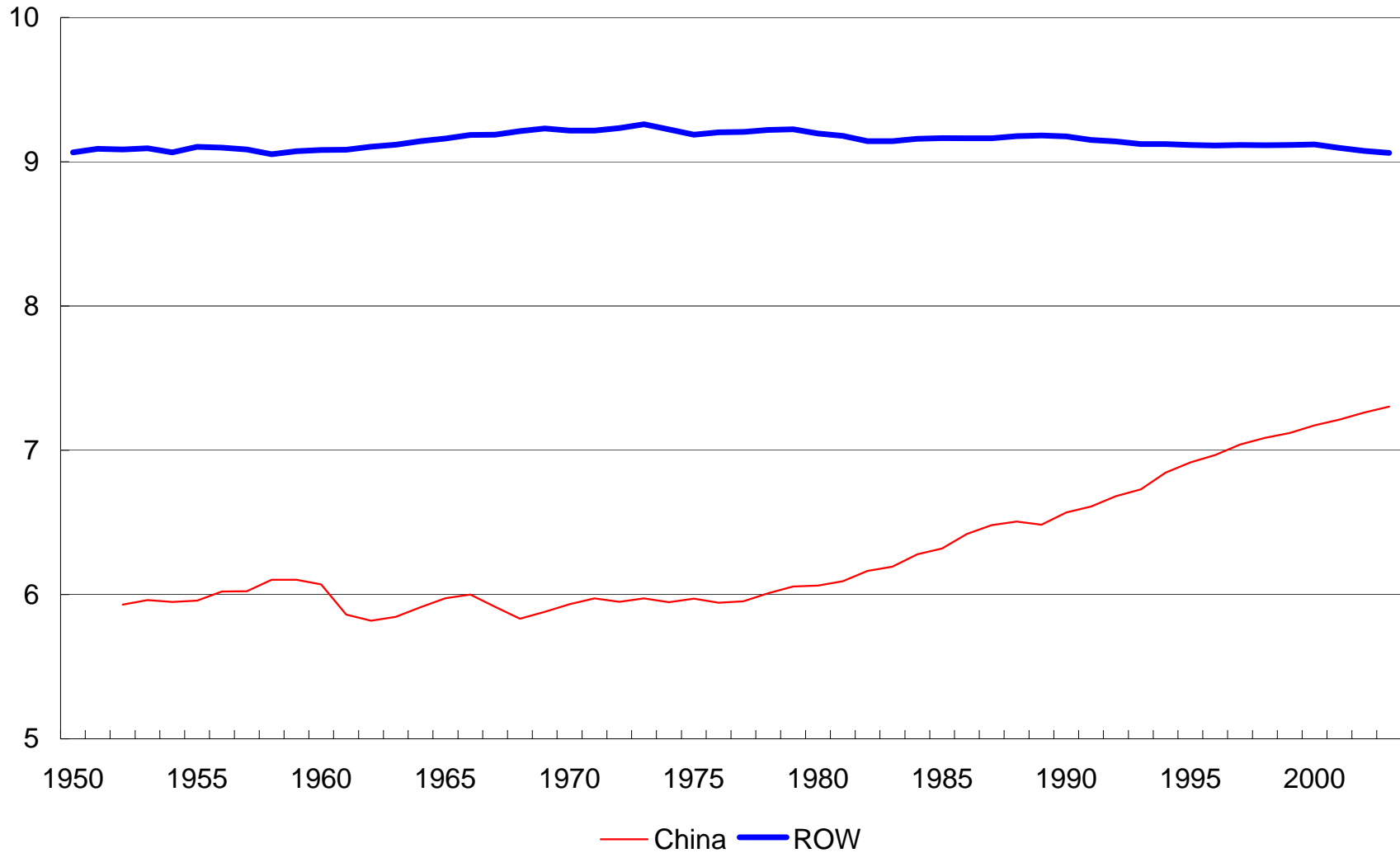
- Facts on Opening-up and Growth in China (data: Penn World Tables 6.2)
- Model
- Quantitative Analysis

# China's Openness



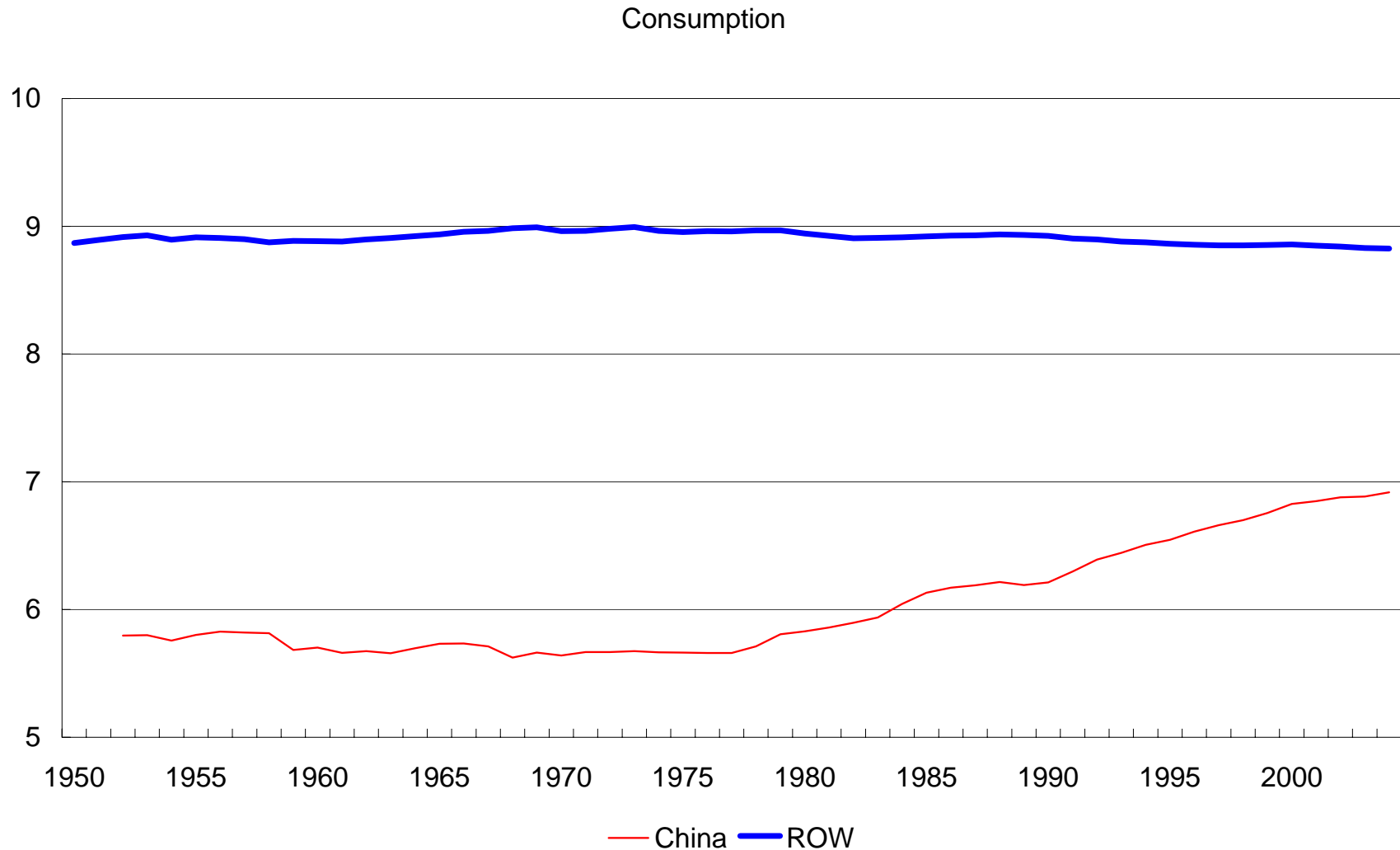


# Output per capita



(in logs, linearly detrended at 2.5% growth)

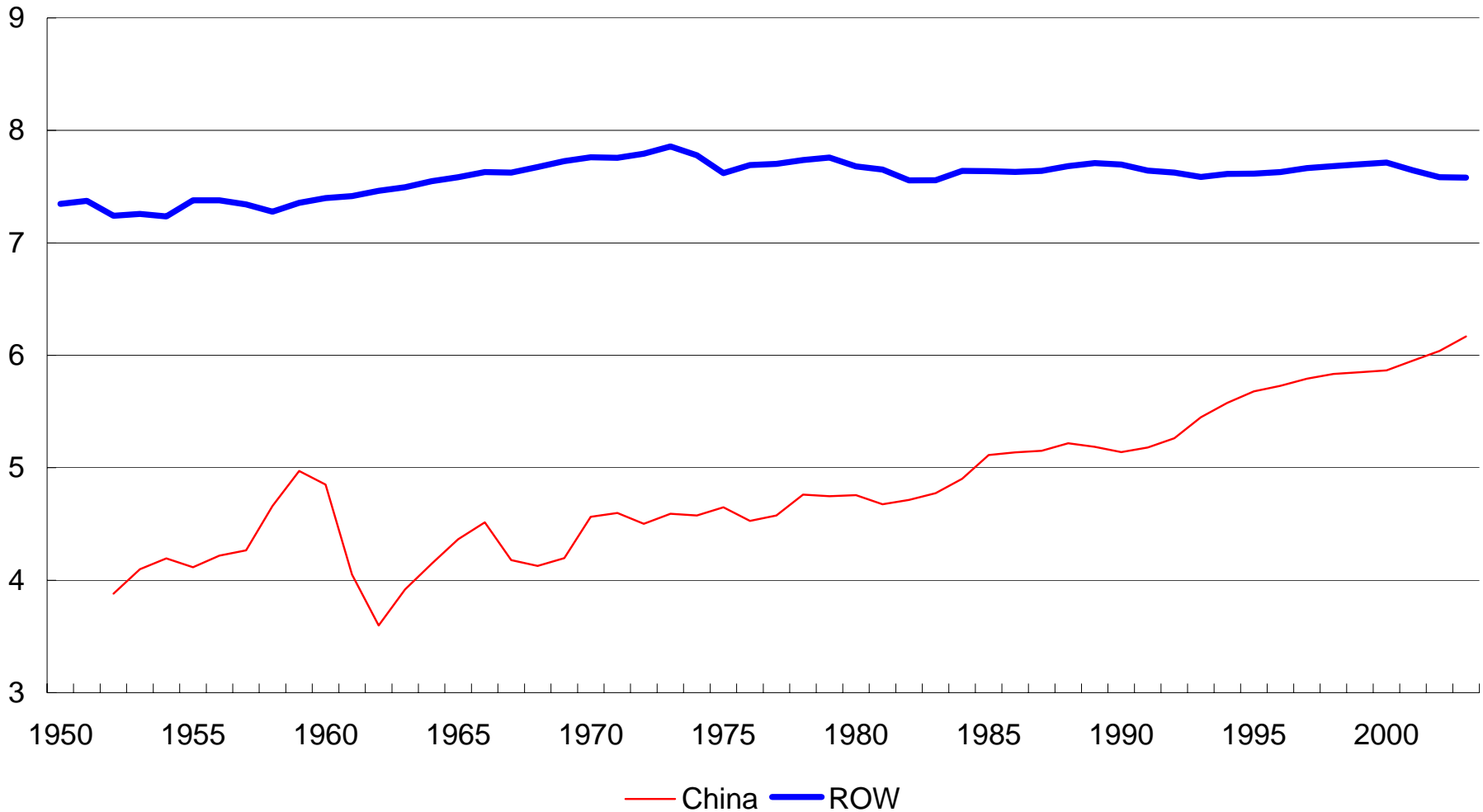
# Consumption per capita



(in logs, linearly detrended at 2.5% growth)

# Investment per capita

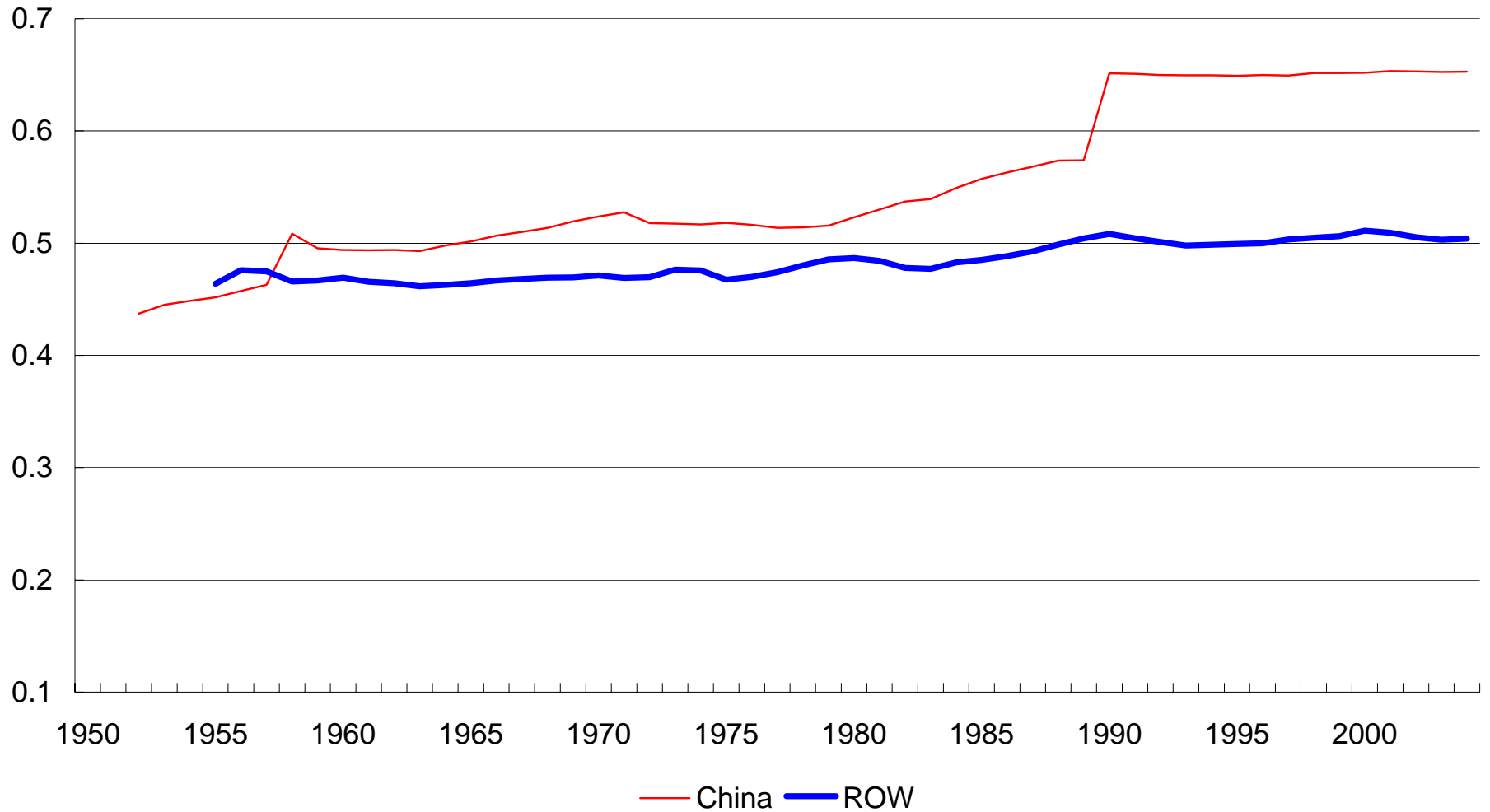
Investment



(in logs, linearly detrended at 2.5% growth)

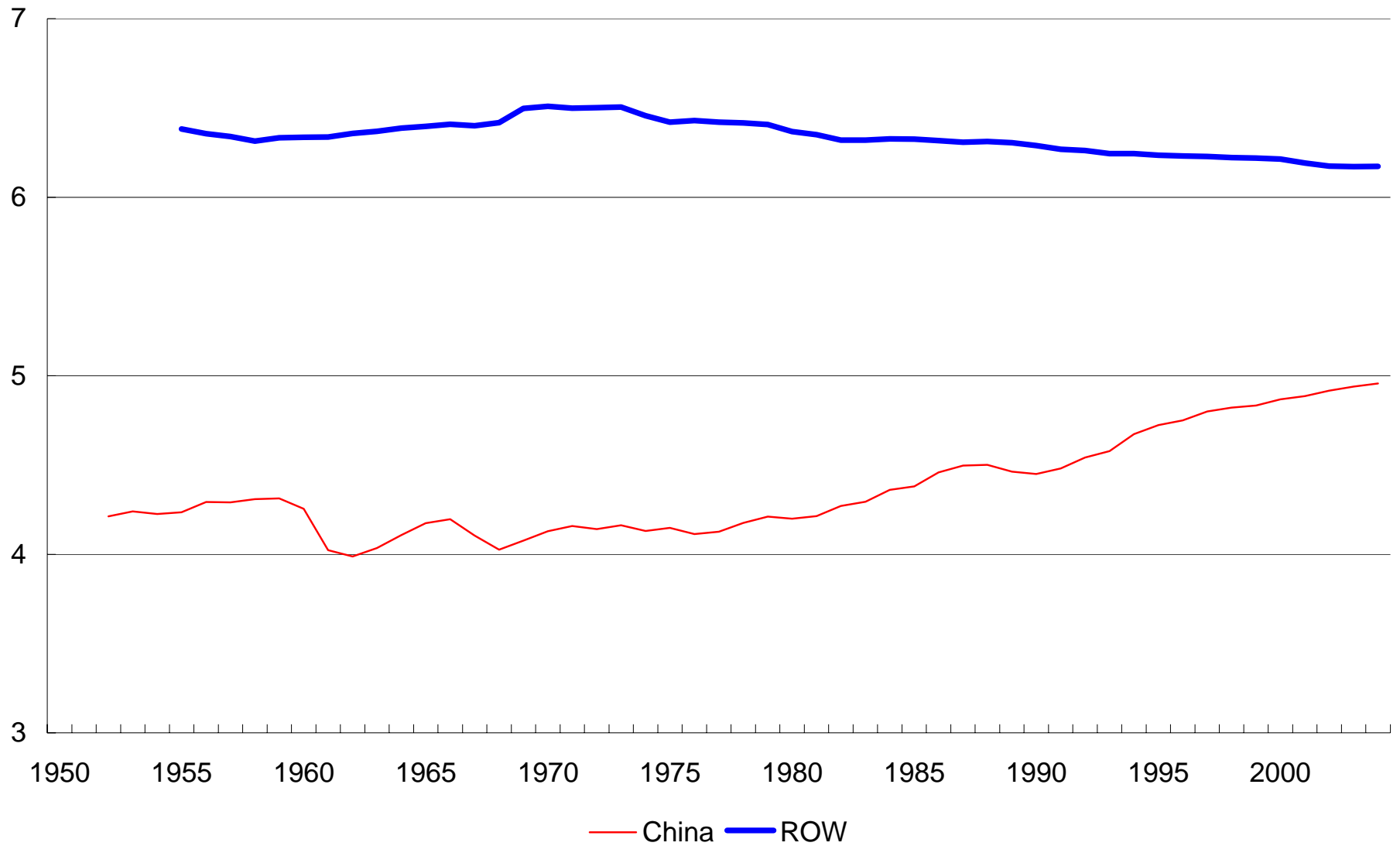
# Employment per capita

Labor



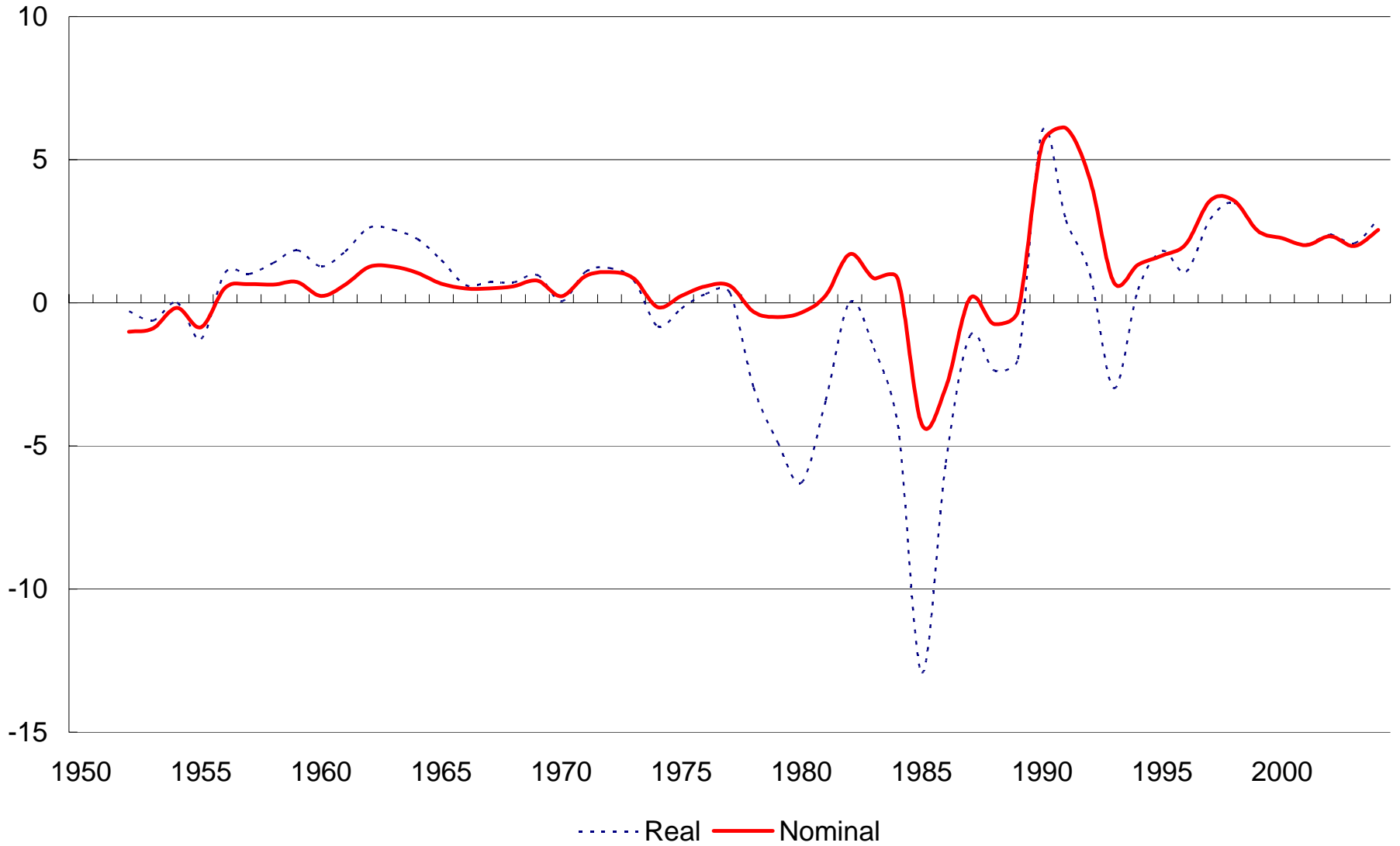
(source: OECD)

# "Crude" Measure of TFP



(linearly detrended at 2.5% growth)

# China's Trade Balance



# Model

- Two-Country, Two-Good: Backus, Kehoe and Kydland (1994)
- Intermediate goods are produced from capital and labor, and are traded in international goods market
  - China specializes in producing intermediate good  $a$
  - ROW specializes in producing intermediate good  $b$
- In each country, final goods are produced from both home and foreign intermediate goods
- State contingent claims are traded in complete international financial market
- Chinese government imposes tariffs on imports in order to maintain balanced trade

# Households

- For  $i = \text{China}, \text{ROW}$ ,

$$\max U_i = \sum_t \beta^t \left( \Psi_i \log c_{i,t} + (1 - \Psi_i) \log(1 - l_{i,t}) \right)$$

subject to

$$w_{i,t}l_{i,t} + r_{i,t}k_{i,t} + T_{i,t} + r_{i,t}d_{i,t} = c_{i,t} + x_{i,t} + r_{i,t}Q_t\Gamma d_{i,t+1}$$

$$\Gamma k_{i,t+1} = (1 - \delta)k_{i,t} + x_{i,t}$$

$T_{i,t}$ : lump-sum transfer from government (only in China)

$r_{i,t}$ : real exchange rate (claims are denominated in ROW currency)

$Q_t$ : price of international claims



# Intermediate Goods Firms

- Using capital and labor, China produces good  $a$ , ROW produces good  $b$
- For  $i = \text{China, ROW}$

$$\max \pi_i = p_i^j y_i - w_i l_i - r_i k_i$$

subject to

$$y_i = \exp(z_i) k_i^\theta l_i^{1-\theta}$$

$p_i^j$ : price of intermediate goods  $j$  in country  $i$  relative to final goods price in country  $i$

$z_i$ : productivity

- $GDP = \underbrace{p \exp(z)}_{\text{TFP}} k^\theta l^{1-\theta}$ : Endogenous movements  $p$  also affect TFP and hence production decisions
- Terms of trade =  $p^a / p^b$

# Final Goods Firm in China

- Both domestic and foreign intermediate goods are used to produce final goods:

$$\max G_{C,t}(a_{C,t}, b_{C,t}, \eta_{C,t}) - p_{C,t}^a a_{C,t} - (1 + \tau_{C,t}) p_{C,t}^b b_{C,t}$$

where

$$G_{C,t}(a_{C,t}, b_{C,t}, \eta_{C,t}) = \left( \eta_{C,t} a_{C,t}^{\frac{\varepsilon-1}{\varepsilon}} + (1 - \eta_{C,t}) b_{C,t}^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

$\tau_{C,t}$  : tariffs on imports

$\varepsilon$  : elasticity of substitution between home and foreign goods

$\eta_{C,t}$  : China's "home goods weight"

- $\eta_{C,t}$  determines the share of Chinese intermediate goods among intermediate goods used to produce final goods

# Final Goods Firm in ROW

$$\max G_{R,t}(a_{R,t}, b_{R,t}, \eta_{R,t}) - p_{R,t}^a a_{R,t} - p_{R,t}^b b_{R,t}$$

where

$$G_{R,t}(a_{R,t}, b_{R,t}, \eta_{R,t}) = \left( (1 - \eta_{R,t}) a_{R,t}^{\frac{\varepsilon-1}{\varepsilon}} + \eta_{R,t} b_{R,t}^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

- ROW government does not impose tariffs

# Government Budget Constraint in China

$$\tau_{C,t} p_{C,t}^b b_{C,t} = T_t$$

# Shocks

- Shocks to China's "home goods weight" ( $\eta_C$ )
  - China's *reform and opening-up policy* → sudden fall in  $\eta_C$
- Shocks to China's productivity ( $z_C$ )
- Throughout, Chinese government adjusts tariffs on imports ( $\tau_C$ ) to maintain balanced trade

# Parameters

		China	ROW
$\pi$	(population weight)	0.5	0.5
$\varepsilon$	(elasticity of substitution)	1.5	1.5
$\delta$	(depreciation)	0.035	0.035
$\beta$	(discount factor)	0.95	0.95
$\Psi$	(preferences)	0.34	0.34
$\eta$	("home goods weight")	0.71	0.71
$\theta$	(capital share)	1/3	1/3

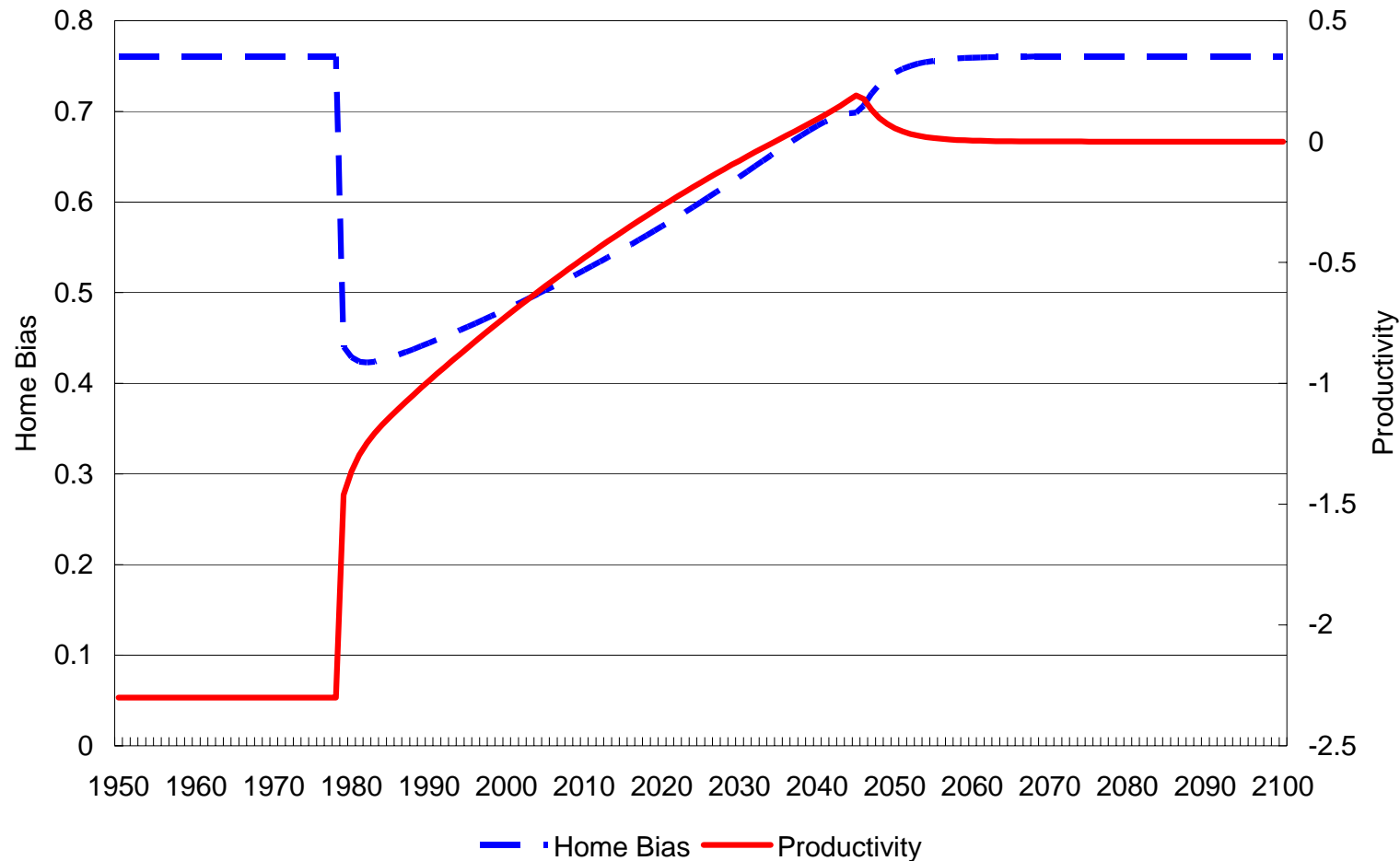
- $\eta$  is chosen so that openness in symmetric steady state is 30%

# Simulation

- Deterministic
- Divide the simulation period into two:
  - Initial equilibrium (1950-1977): China has low openness and low GDP (5% of ROW)
  - Post-1978 (1978-2100): In 1978, agents are surprised by shocks to China's home goods weight and productivity and re-optimize
- Choose shocks to China's home goods weight and productivity such that:
  - China's openness jumps up from 10% to 30% in 1978 and remains at that level
  - China's per-capita GDP growth rate jumps up from 2.5% to 7.5% in 1978 and stays at that rate until China's GDP catches up to ROW level

# Implied Path of Exogenous Variables:

China's Home Goods Weight ( - - - ), China's detrended Productivity ( — )

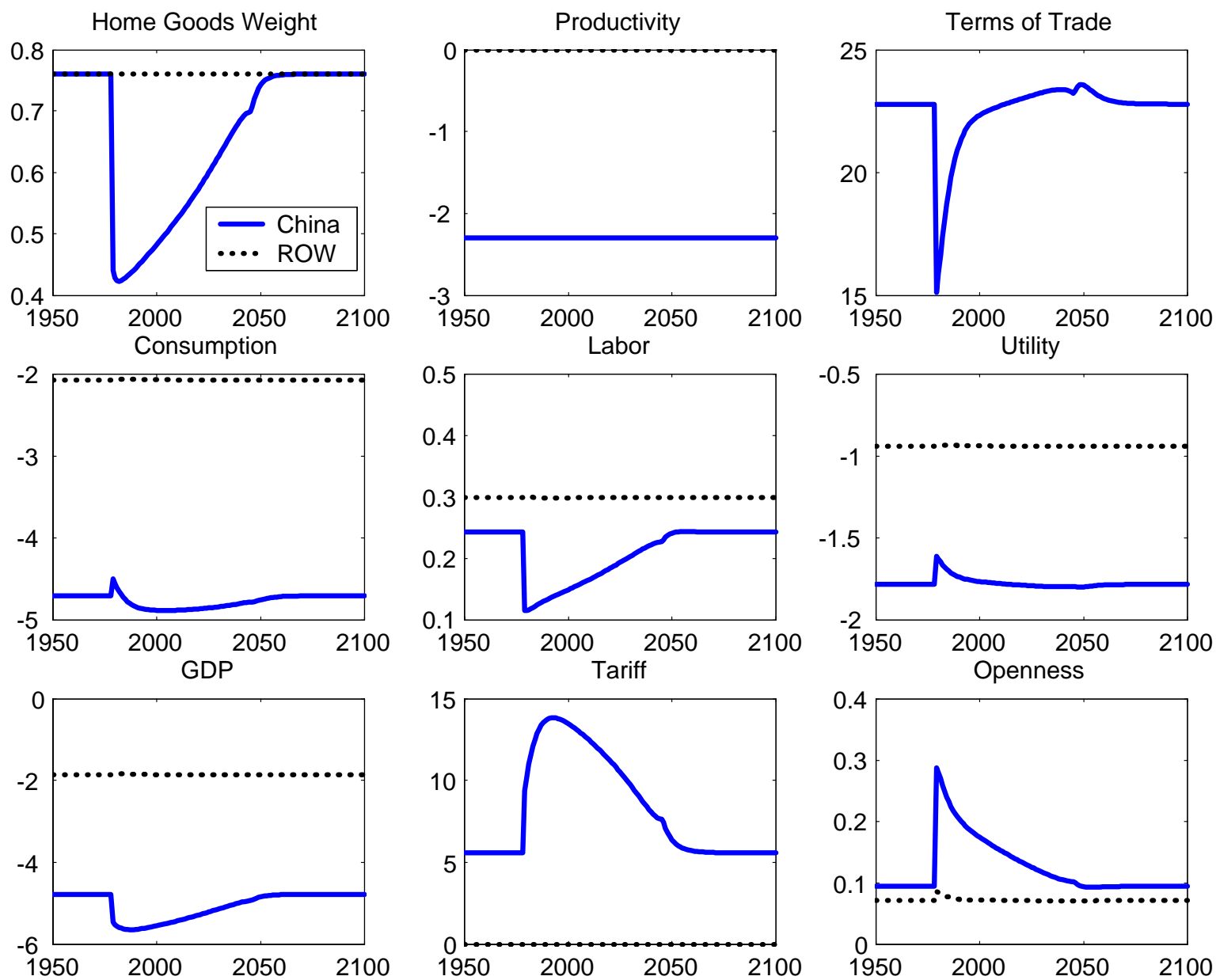


1950-77: China's GDP level is 5% of ROW, GDP growth is 2.5%, openness is 10%

1978- : China's GDP growth is 7.5% (until reaching ROW level), openness is 30%

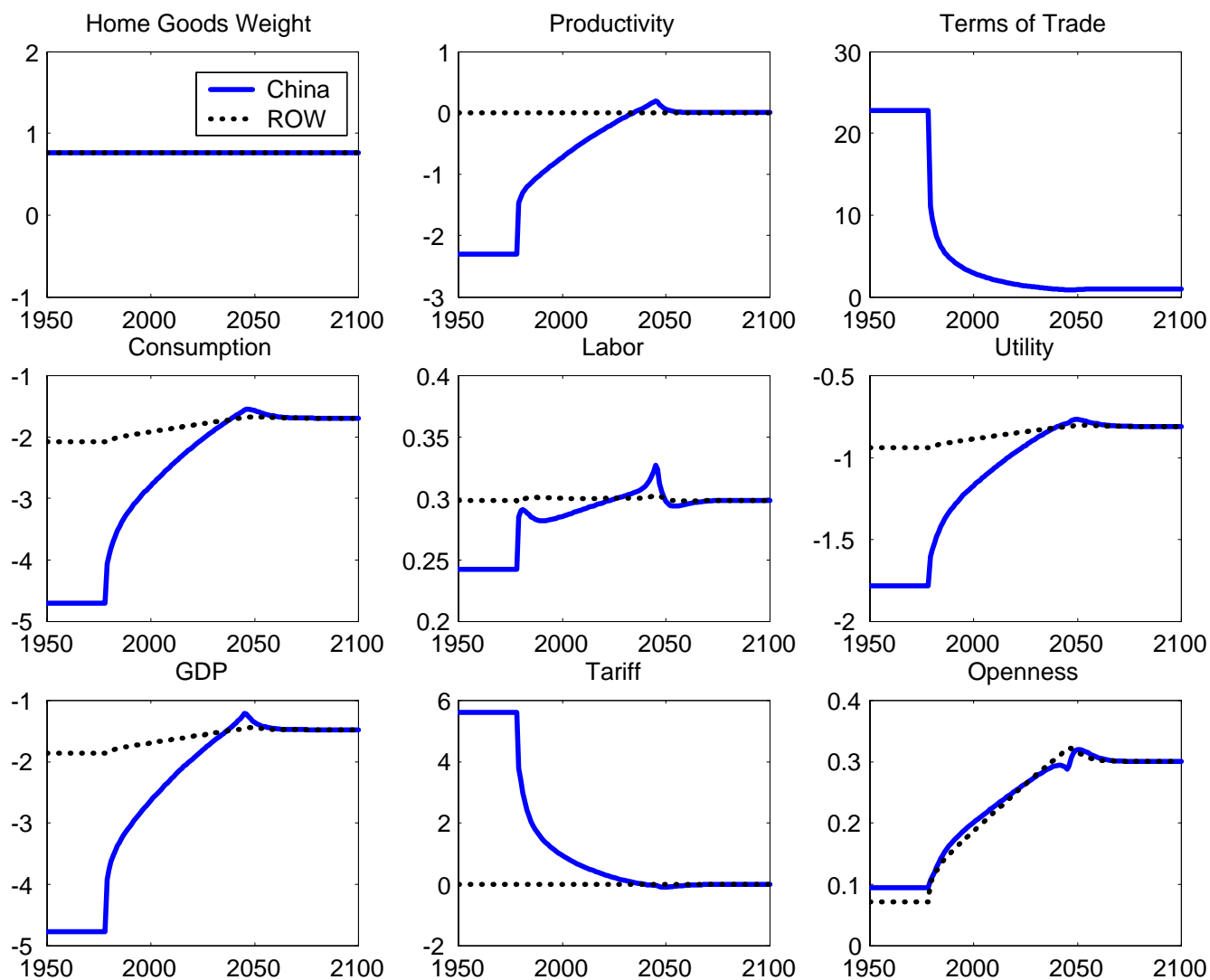


# Shocks to China's "Home Goods Weight" Only



China: imports more and produces less (labor ↓)

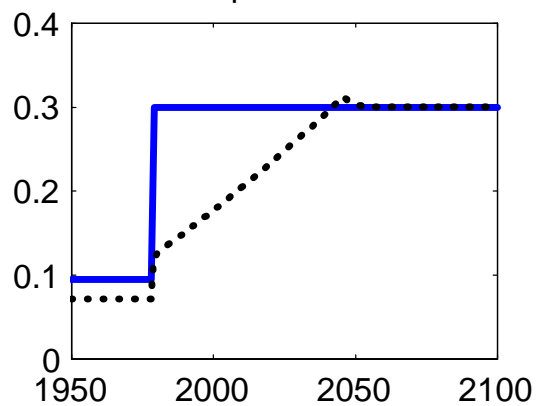
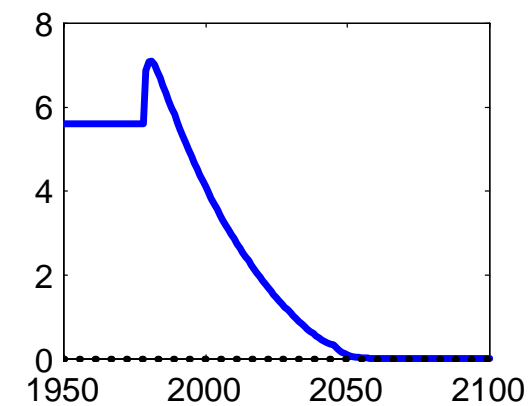
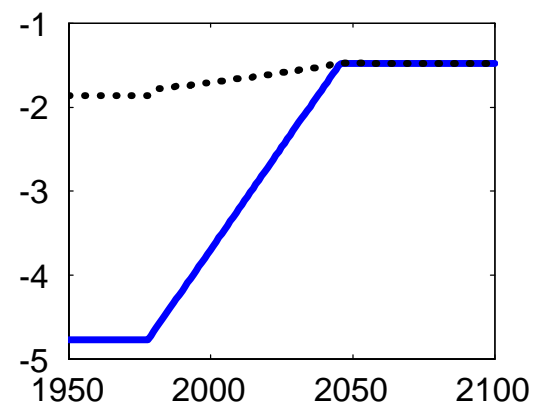
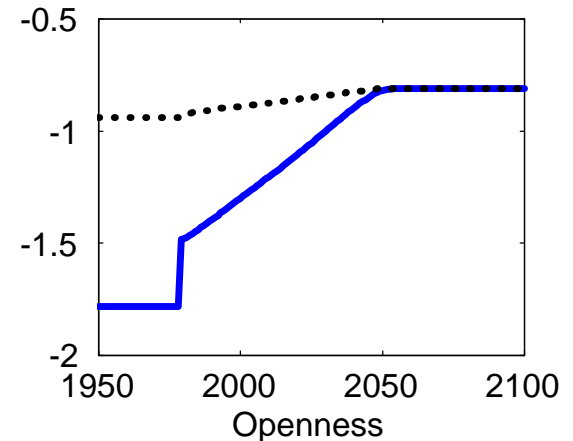
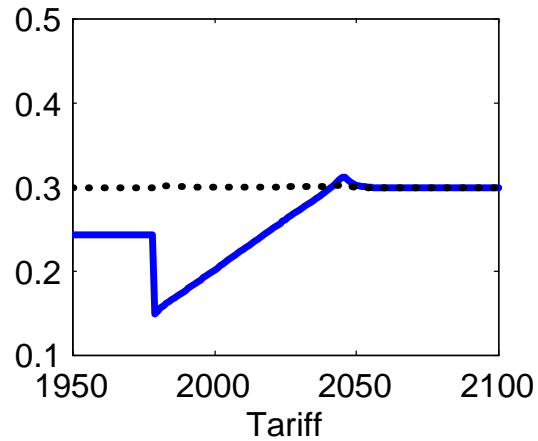
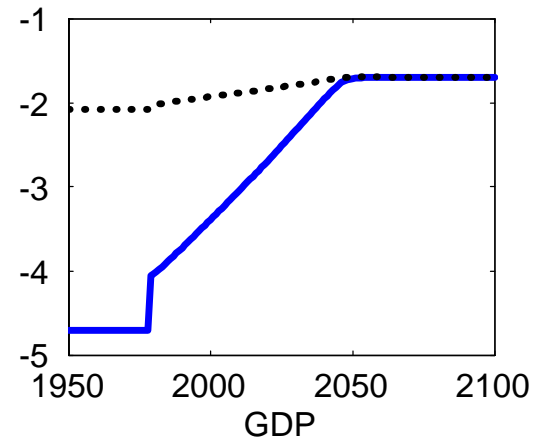
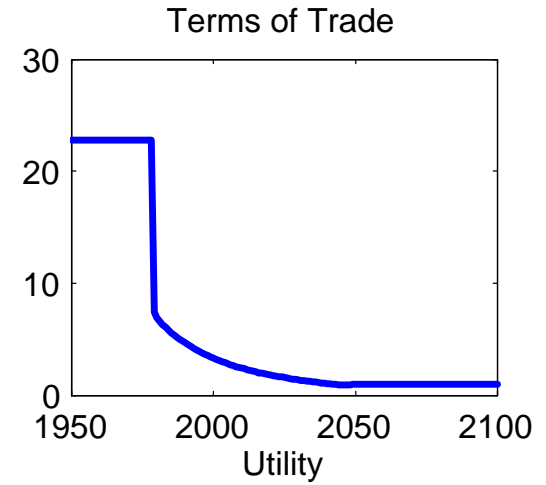
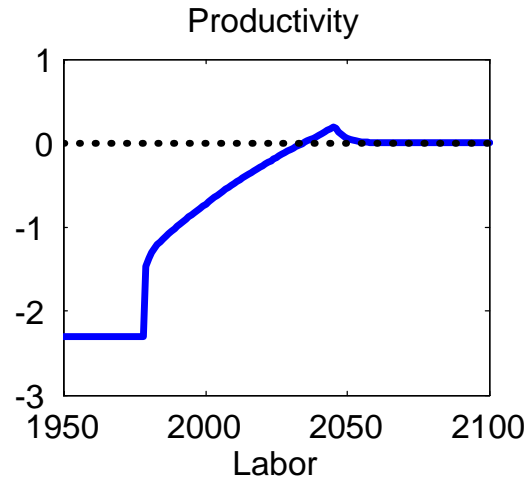
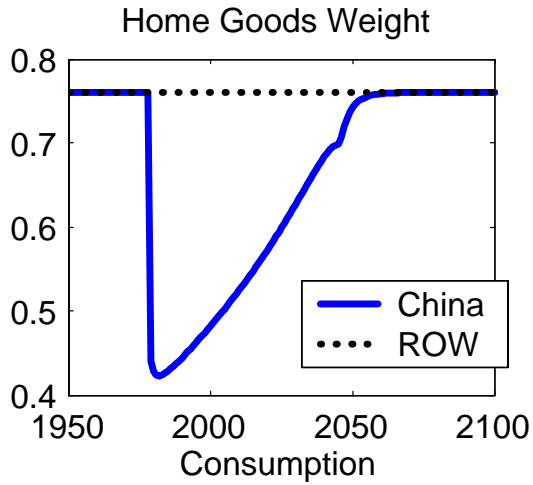
# Shocks to China's Productivity Only



China: sustained increase in consumption

ROW: terms of trade improves  $\rightarrow$  consumption  $\uparrow$

# Both Shocks



# Effects on Welfare

- Welfare improvements relative to the case of no shocks to China's home goods weight and productivity:

	Both Shocks	$\eta_C$ Only	Productivity Only
China	8.31	0.95	9.52
ROW	0.82	0.03	0.84

- – China's opening-up: welfare improving for China, little impact on ROW
- China's productivity growth: welfare improving for both China and ROW
- Combination of China's opening-up and productivity growth: welfare improving for both China and ROW

# Counterfactual Simulation

- What if China removed tariffs in 1978 and did not maintain balanced trade after 1978?
- Removal of tariffs stimulates China's imports:
  - China runs trade deficit, works less, and consumes more
    - \* Removal of tariffs is welfare-improving for China
  - ROW works harder in order to meet increased demand from China
    - \* Removal of tariffs is welfare-decreasing for ROW
- In the following simulations, shocks to China's home goods weight and productivity are the same as in previous simulations

# Effects on Welfare (No Tariff Case)

- Welfare improvements relative to the case of no shocks to China's home goods weight and productivity:

	Both Shocks	$\eta_C$ Only	Productivity Only
China	14.94	12.29	11.29
ROW	-1.92	-3.72	-0.21

- China's welfare would have been higher and ROW's welfare would have been lower if the balanced trade constraint was removed in 1978

# Conclusion

- China's opening-up is welfare improving for both China and ROW if it led to significant productivity growth in China
- China's balanced trade helped ROW at the expense of China

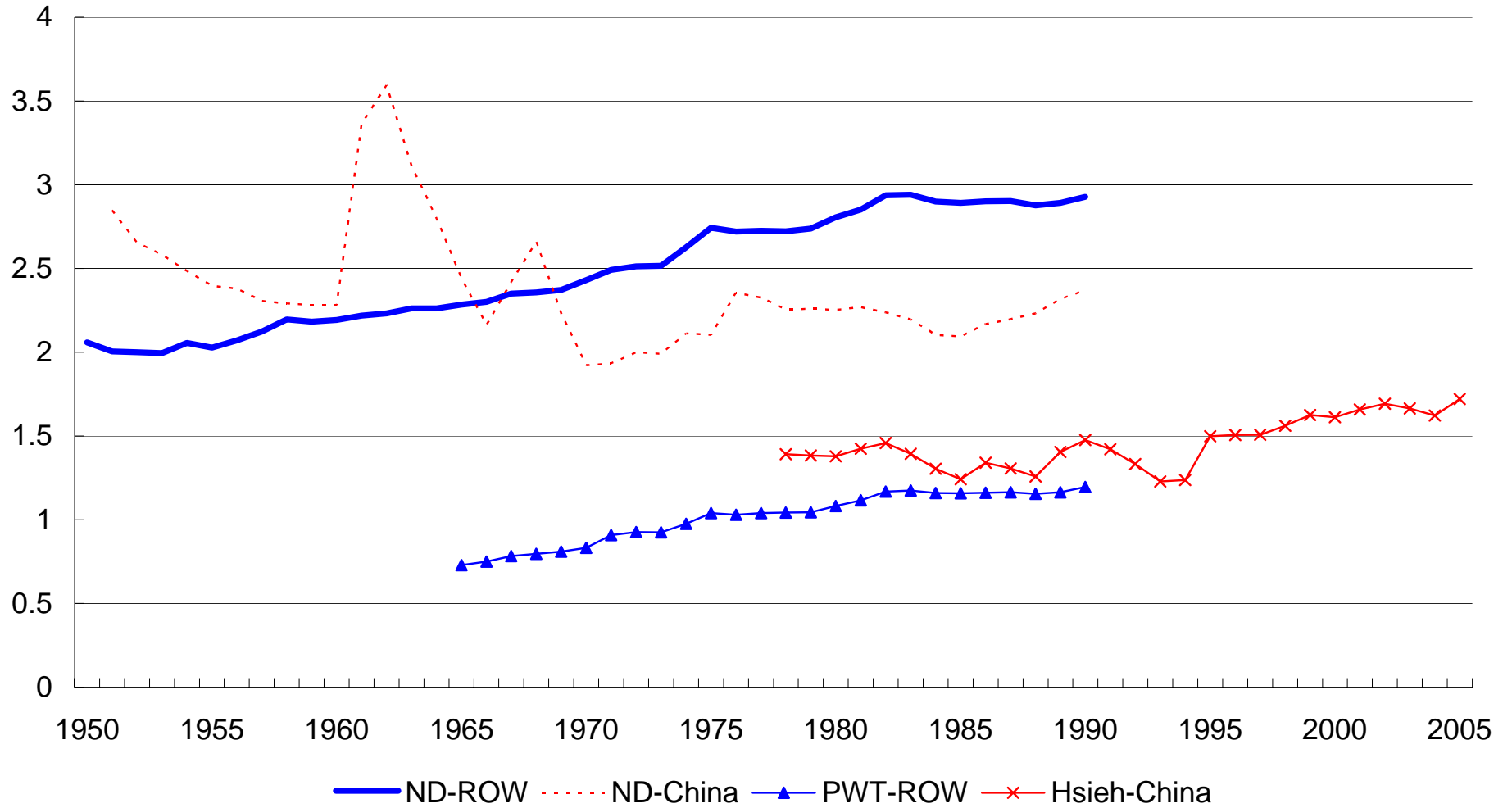
# Extensions

- Link between opening-up and productivity growth
  - Import of ideas
- Balanced trade in China
  - Incomplete international capital market, Infant industry protection,
- Stochastic model

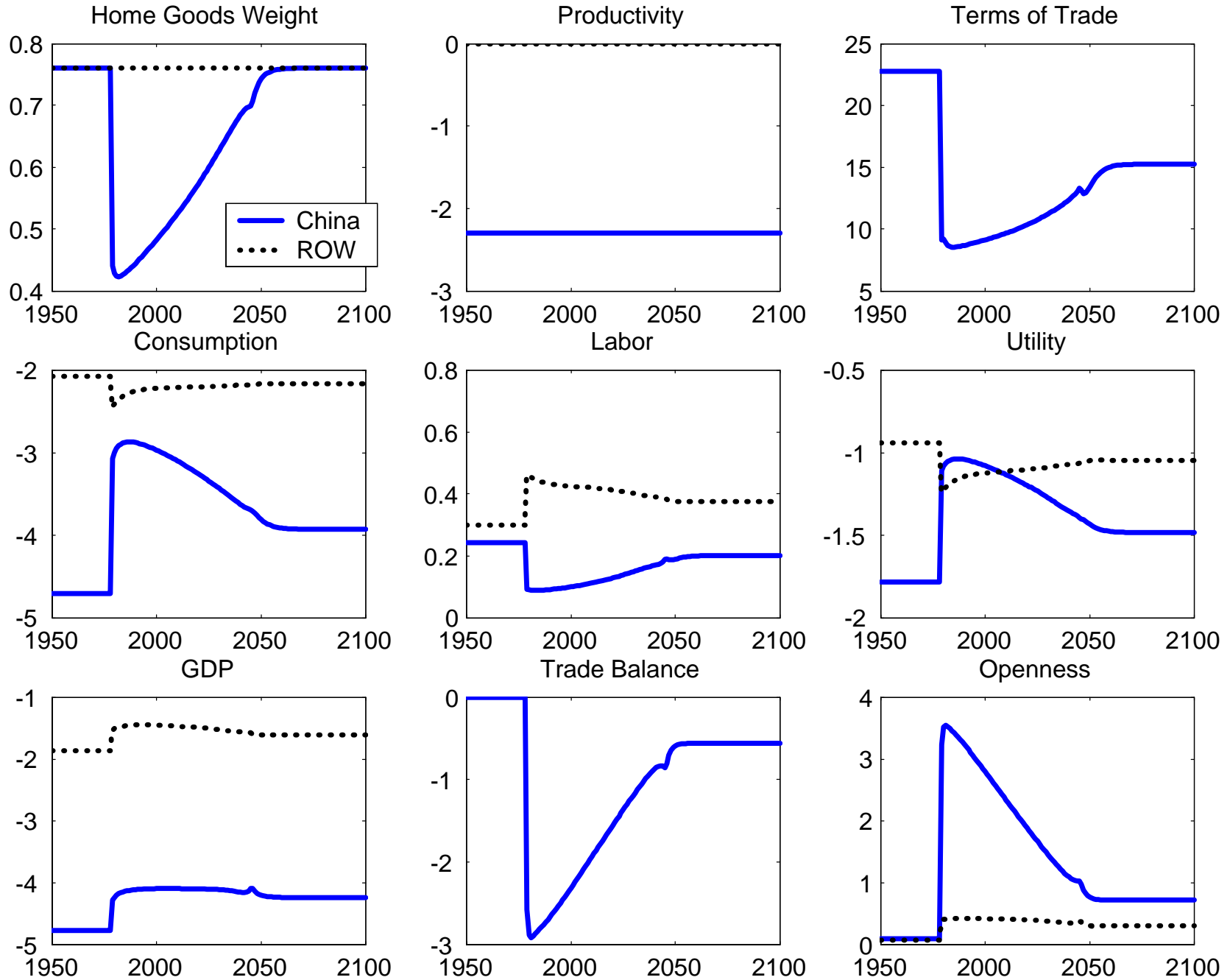


# Capital-Output Ratio

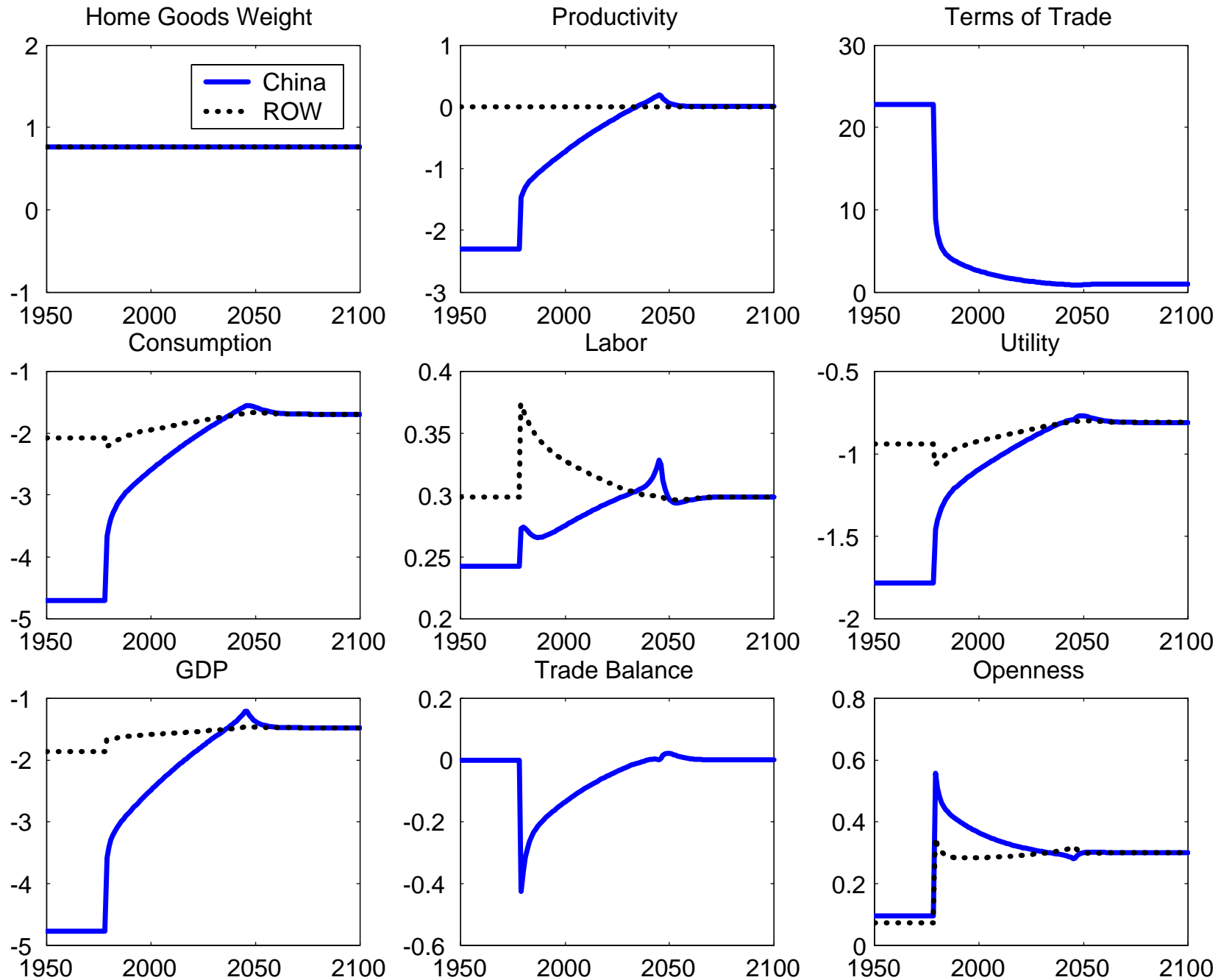
Capital Output Ratio



# Shocks to China's "Home Goods Weight" Only (No Tariff)



# Shocks to China's Productivity Only (No Tariff)



# Both Shocks (No Tariff)

