

# **Sudden Stops, Sectoral Reallocations, and Real Exchange Rates**

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# What Happens During a Sudden Stop? Mexico 1994-95

Opens to capital flows: late 1980s

- trade deficits
- real exchange rate appreciation

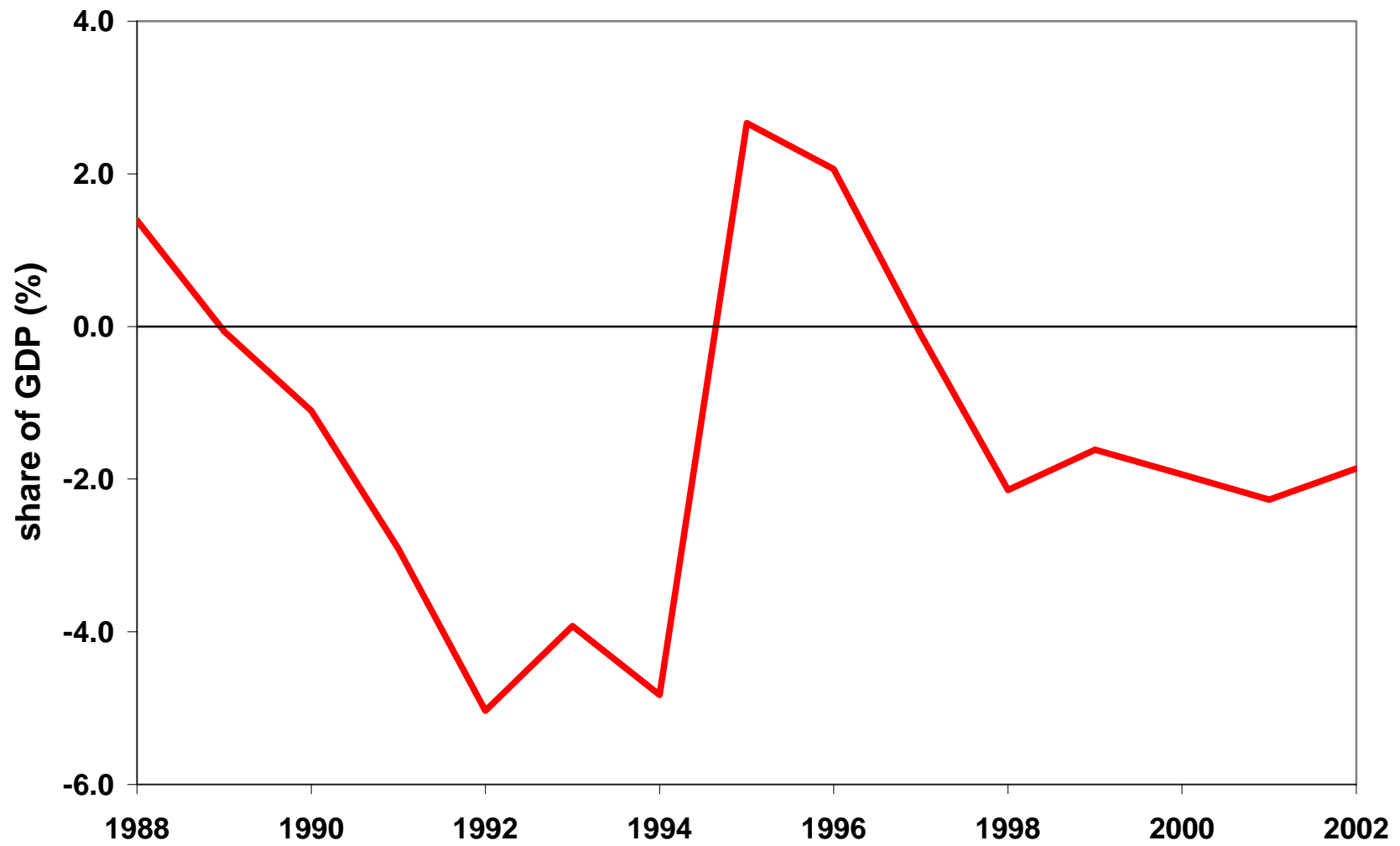
Sudden stop: 1994-95

- trade surplus
- real exchange rate depreciation
- reallocation from nontradables to tradables
- fall in GDP, TFP

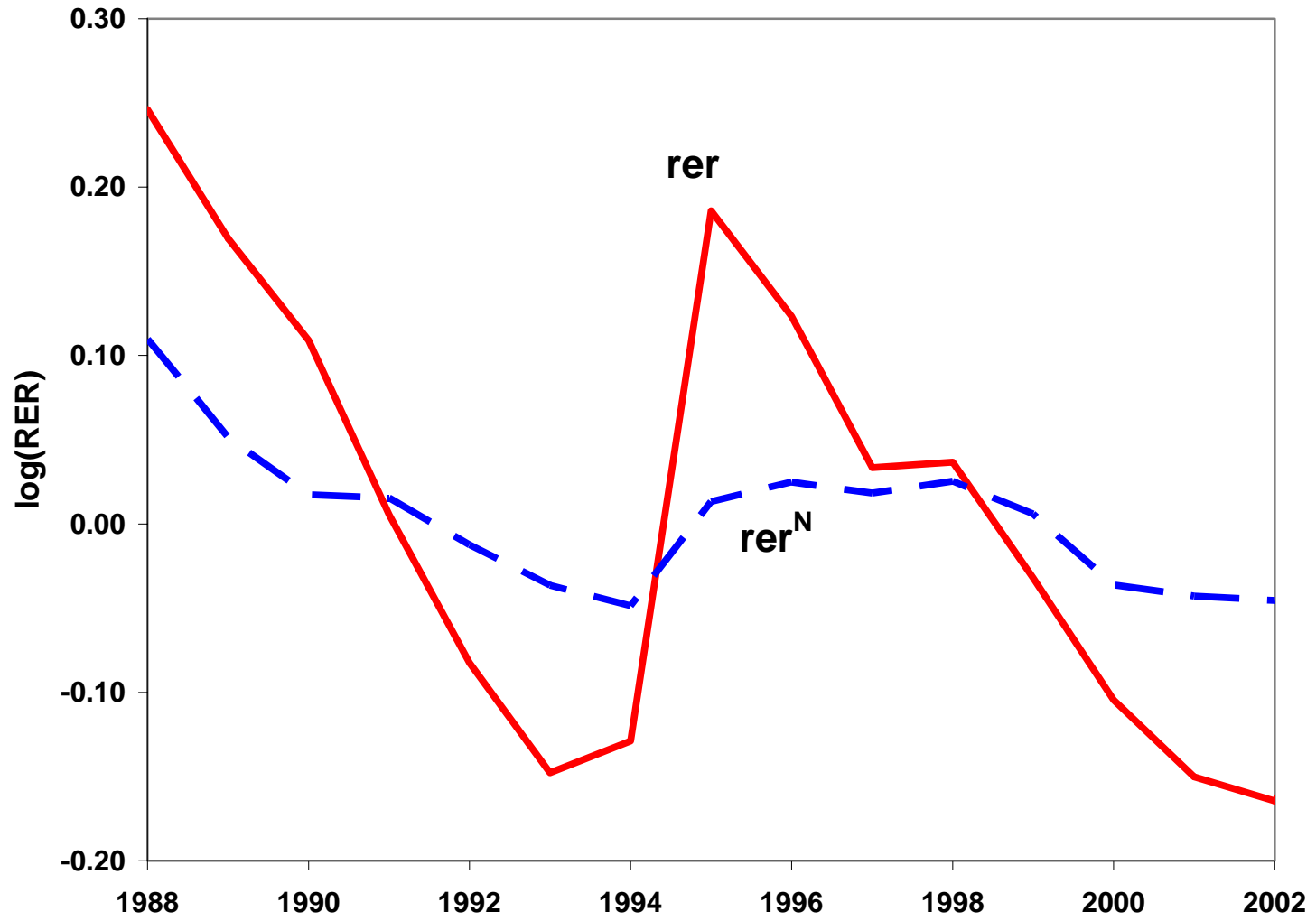
End of sudden stop

- trade deficits
- real exchange rate appreciation
- recovery of GDP, TFP

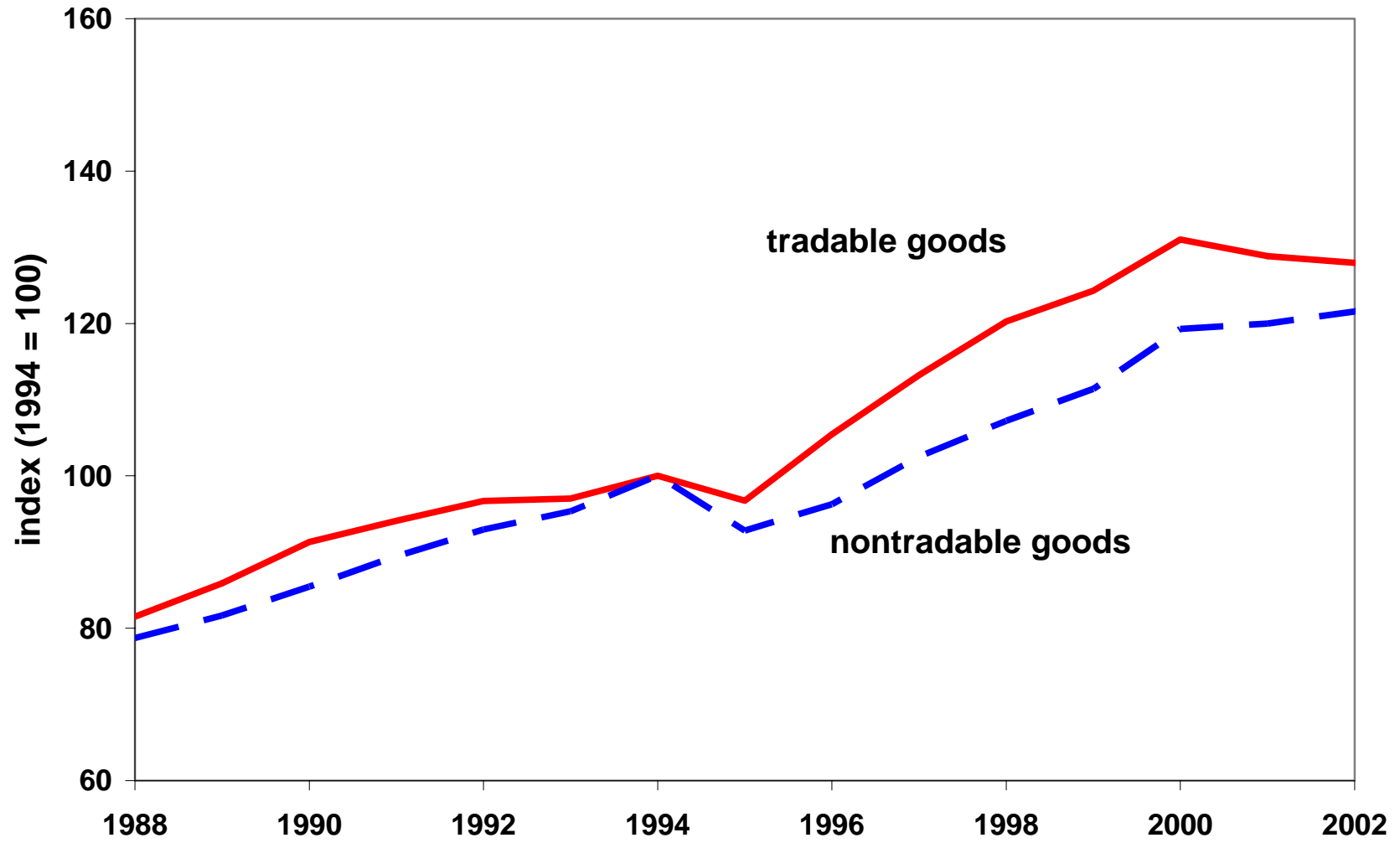
## Mexico: trade balance



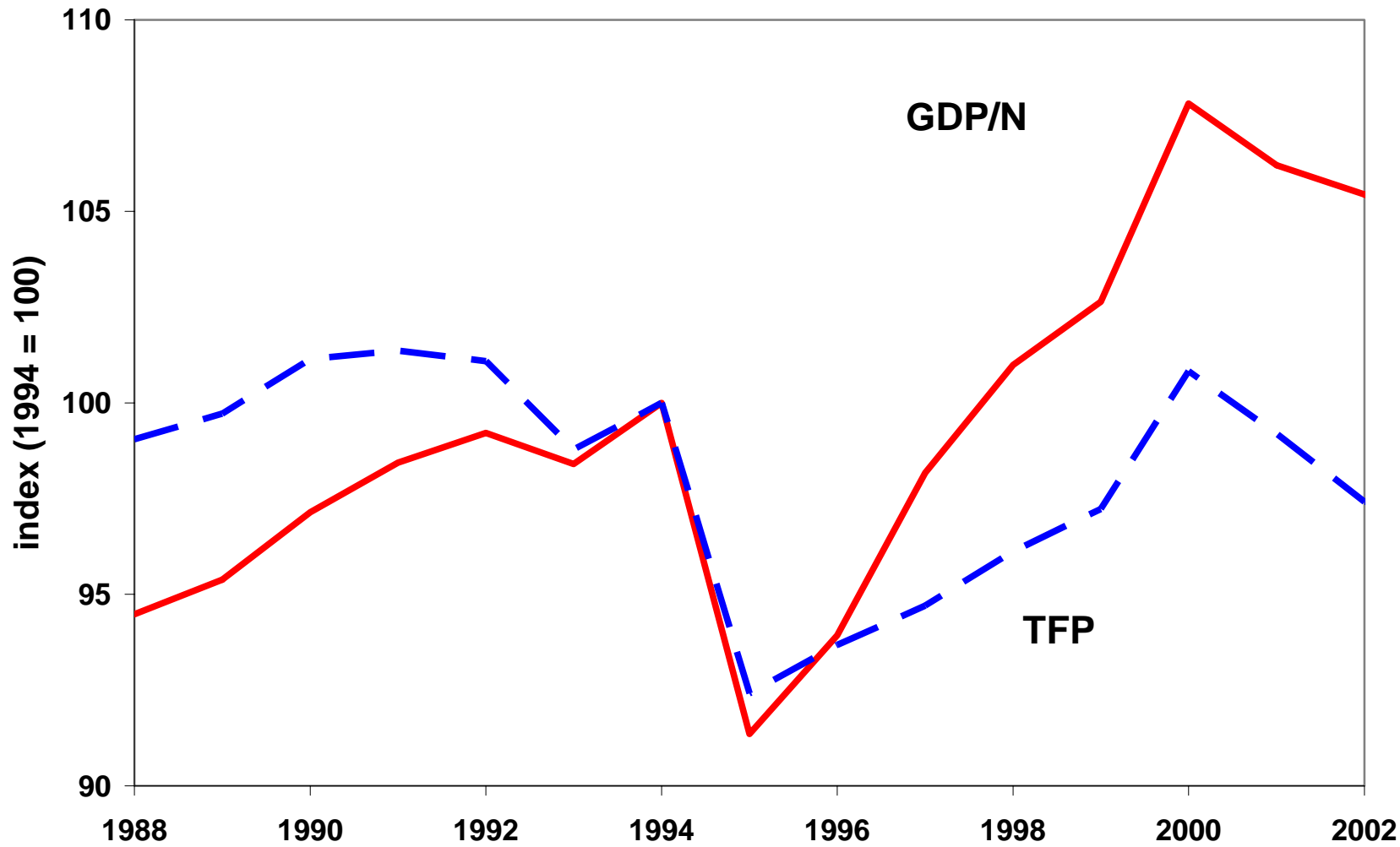
### Mexico-U.S. real exchange rate



# Mexico: sectoral value added



### Mexico: output and TFP



## **Candidate Explanations**

- labor hoarding
- variable capital utilization

## **Growth Accounting Discipline**

Measured TFP must decline!

## Our model

- Small open economy
  - multisector: tradable, nontradable
  - costly to adjust labor across sectors
- Sudden stop
  - tradable good price increase, increase production
  - capital and labor misallocated
- Model accounts for:
  - real exchange rate, relative prices
  - trade balance
  - GDP (if TFP is exogenous)
- Misses:
  - TFP, GDP

## Model overview

- Growth model: small open economy
- Nontradable good,  $y_N$ , and domestic tradable good,  $y_D$ 
  - production use intermediates, capital, and labor
- Composite tradable  $y_{Tt} = f(y_{Dt}, m_t)$
- Frictions:
  - costly to move labor across sectors
- Quantitative model

## Production functions

Domestically produced traded good

$$y_{Dt} = \min \left[ z_{TDt} / a_{TD}, z_{NDt} / a_{ND}, A_D k_{Dt}^{\alpha_D} \left( \gamma^t \ell_{Dt} \right)^{1-\alpha_D} \right] - \Theta_D \left( \ell_{Dt-1}, \ell_{Dt} \right) \ell_{Dt-1}$$

$$\text{where } \Theta_D \left( \ell_{Dt-1}, \ell_{Dt} \right) = \gamma^t \theta_D \left( \frac{\ell_{Dt} - \ell_{Dt-1}}{\ell_{Dt-1}} \right)^2$$

Nontraded good

$$y_{Nt} = \min \left[ z_{TNt} / a_{TN}, z_{NNt} / a_{NN}, A_N k_{Nt}^{\alpha_N} \left( \gamma^t \ell_{Nt} \right)^{1-\alpha_N} \right] - \Theta_N \left( \ell_{Nt-1}, \ell_{Nt} \right) \ell_{Nt-1}$$

$$\text{where } \Theta_N \left( \ell_{Nt-1}, \ell_{Nt} \right) = \gamma^t \theta_N \left( \frac{\ell_{Nt} - \ell_{Nt-1}}{\ell_{Nt-1}} \right)^2$$

Composite traded good (Armington aggregator)

$$y_{Tt} = M \left( \mu x_{Dt}^\zeta + (1 - \mu) m_t^\zeta \right)^{\frac{1}{\zeta}}$$

Investment good

$$i_{Dt} + i_{Nt} = \Phi z_{TIt}^\phi z_{NI}^{1-\phi}$$

$$k_{Dt+1} = i_{Dt} + (1 - \delta) k_{Dt}$$

$$k_{Nt+1} = i_{Nt} + (1 - \delta) k_{Nt}$$

Market clearing, balance of payments

## Exogenous processes

- Country risk premia,  $\sigma_t^{mex}$

1. with access to international capital

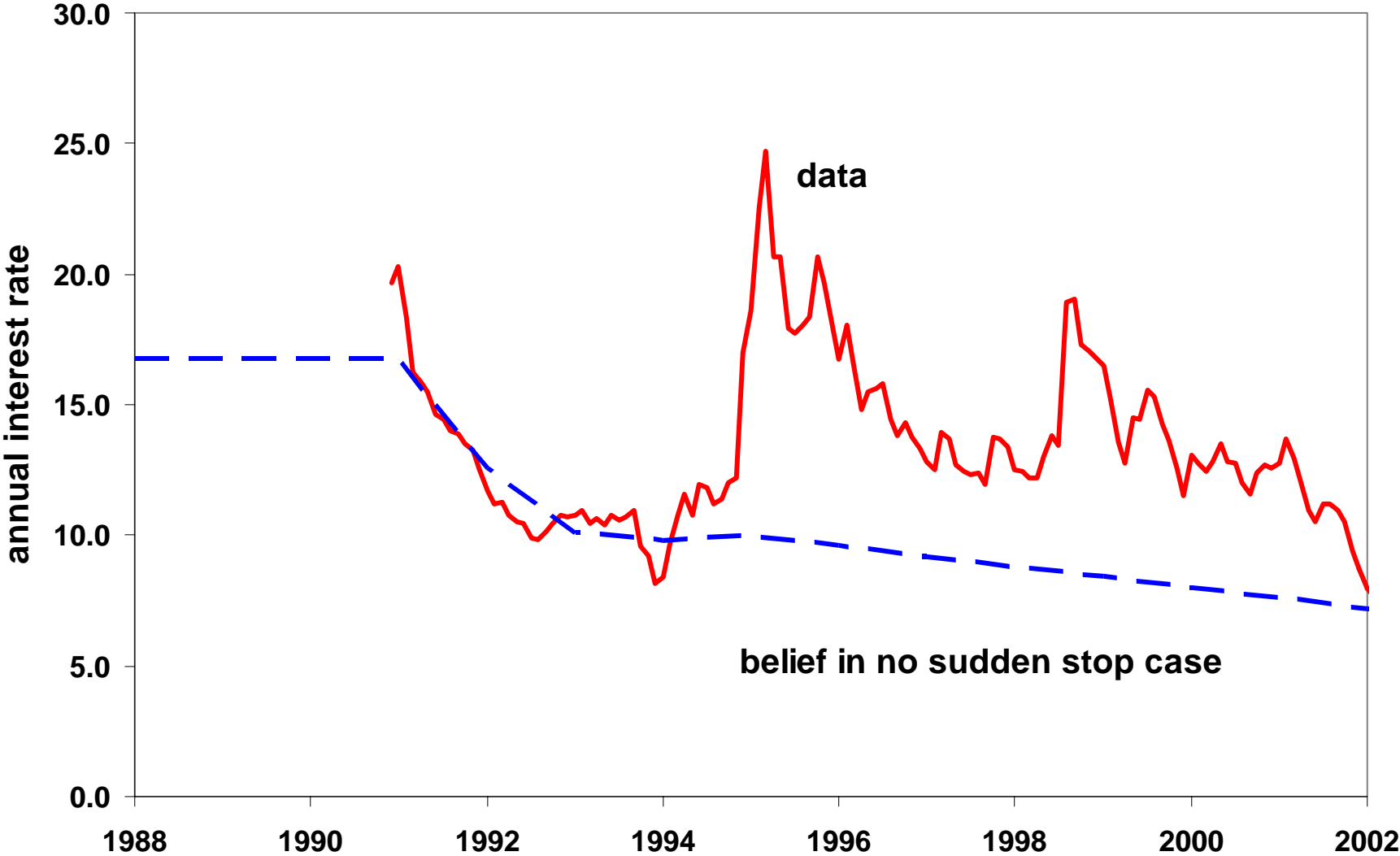
$$r_t^{mex} = r^* + \sigma_t^{mex}$$

2. without access to international capital

$r_t^{mex}$  is domestically determined

- Populations,  $n_t$ , and working age population,  $\ell_t$
- Mexican tariff rates,  $\tau_{Dt}$ , and world tariff rates,  $\tau_{Ft}$

# Mexico: interest rates

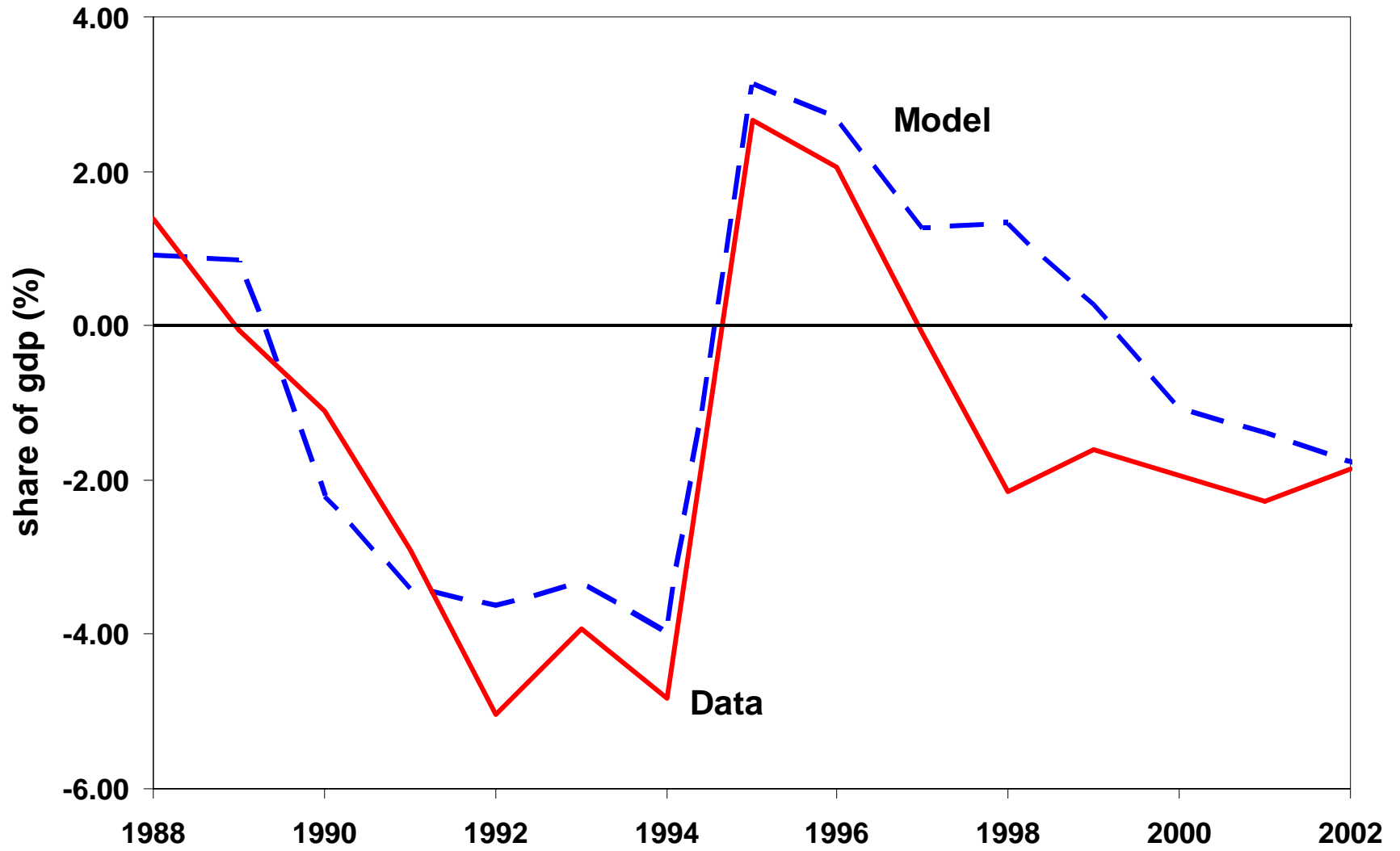


## Sudden stop!

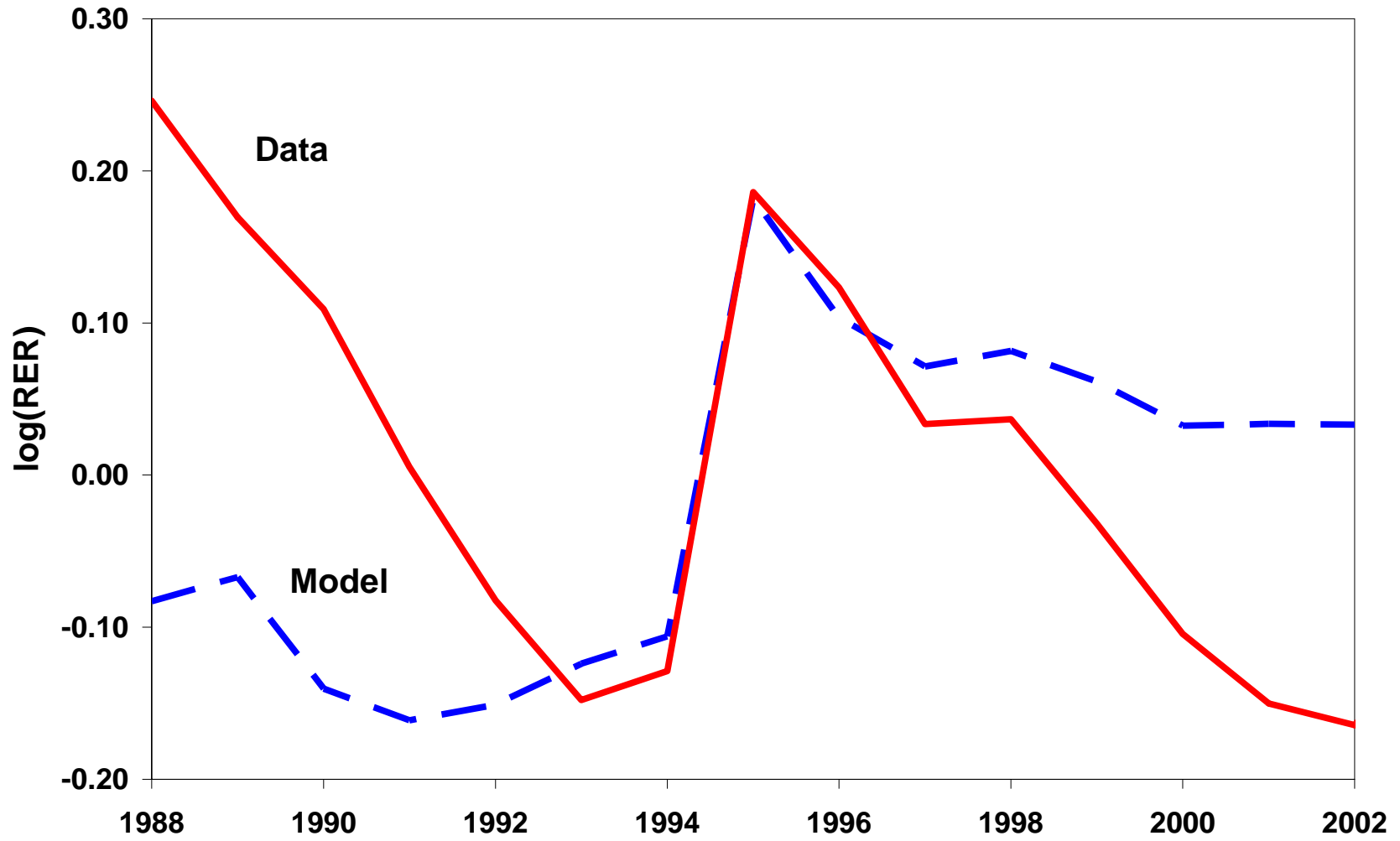
$$b_t = b_{t-1}, t = 1995, 1996$$

- agents do not foresee sudden stop
- agents do foresee length of sudden stop
- domestic interest rate is endogenously determined
- interest payments on foreign debt made at  $r^*$

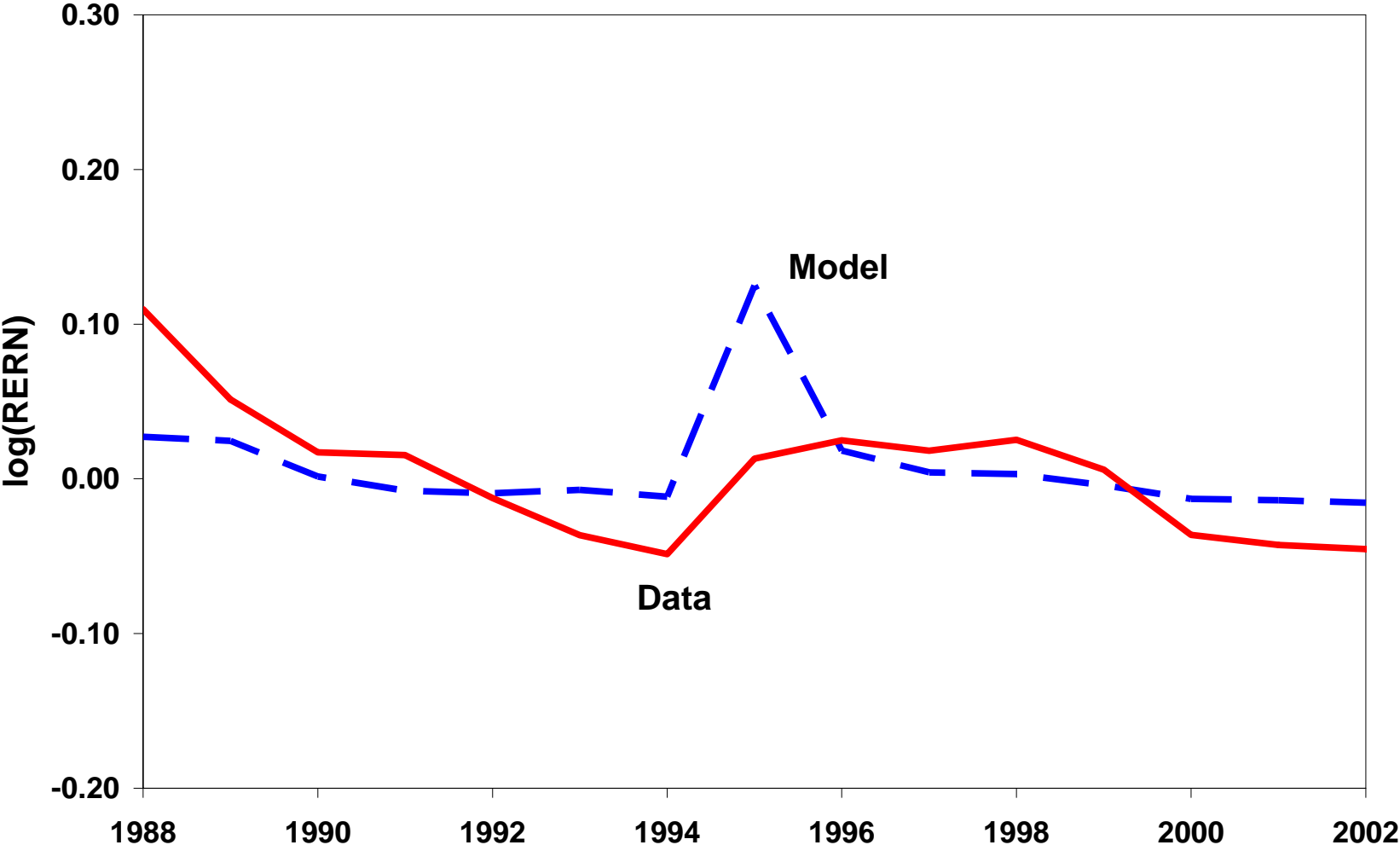
# Mexico: trade balance



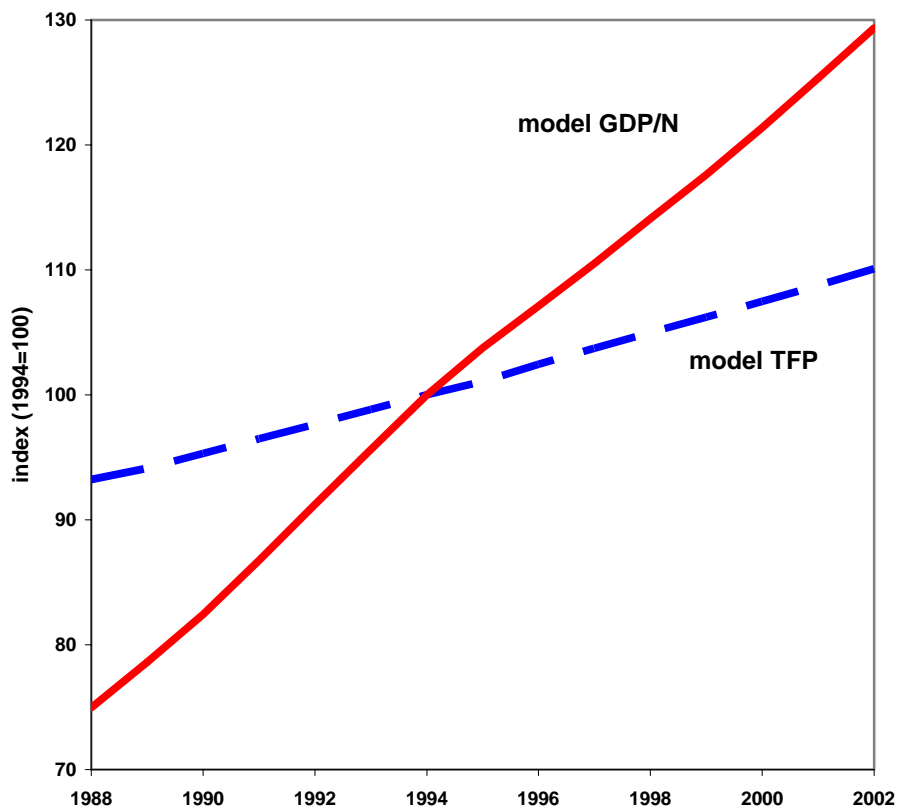
# Mexico: real exchange rates



# Mexico: nontraded/traded good prices

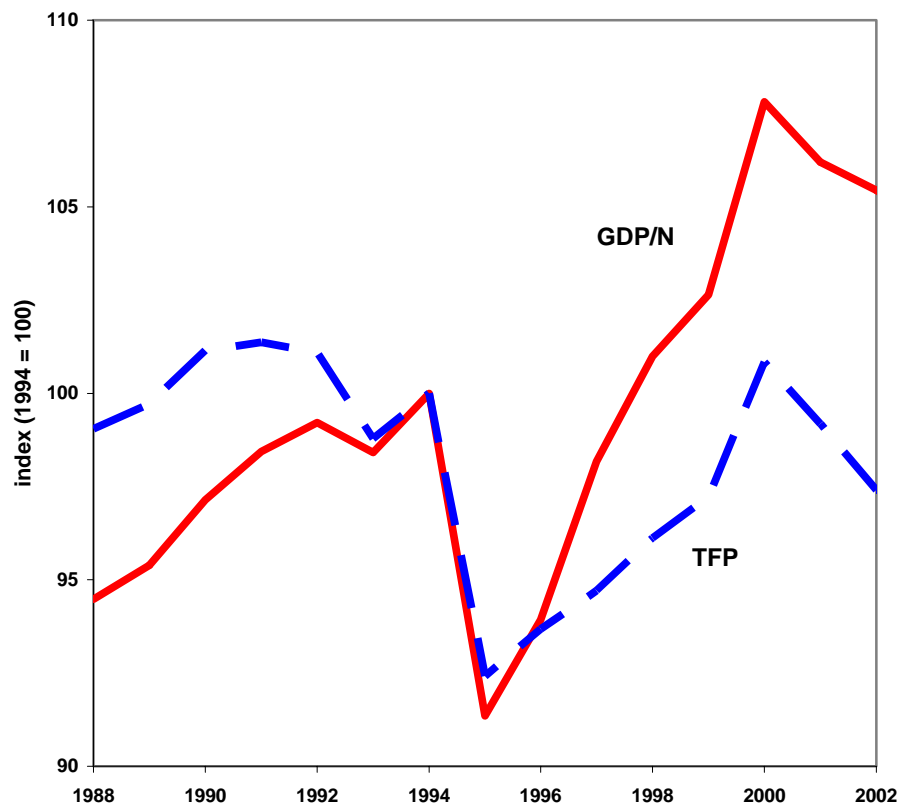


Mexico: output and TFP



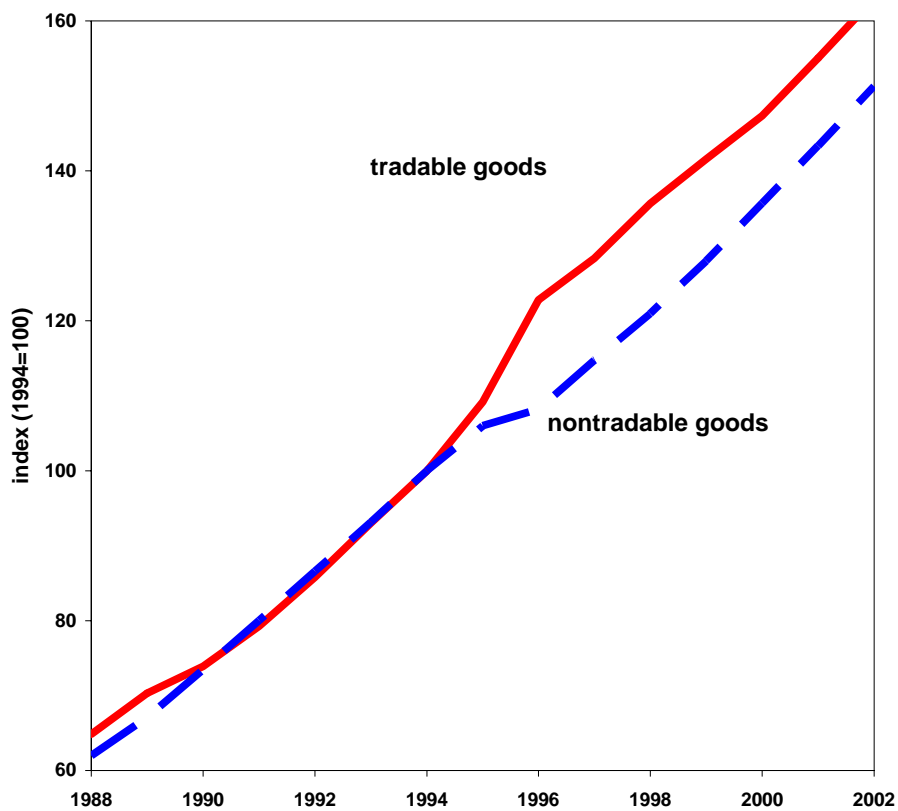
Model

Mexico: output and TFP



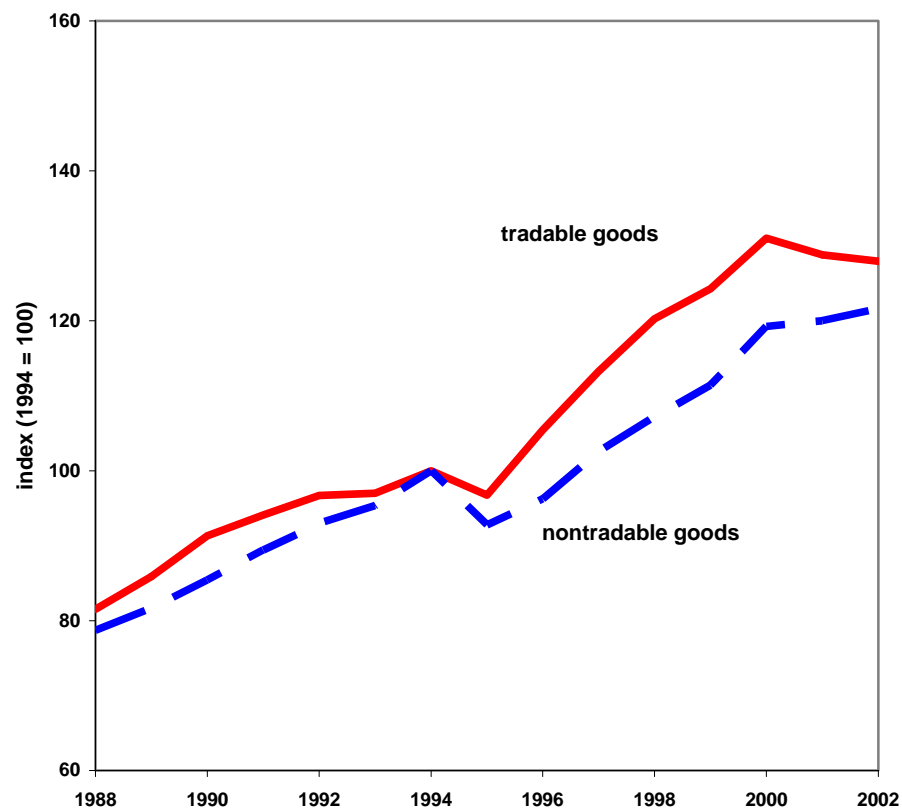
Data

Mexico: sectoral value added



Model

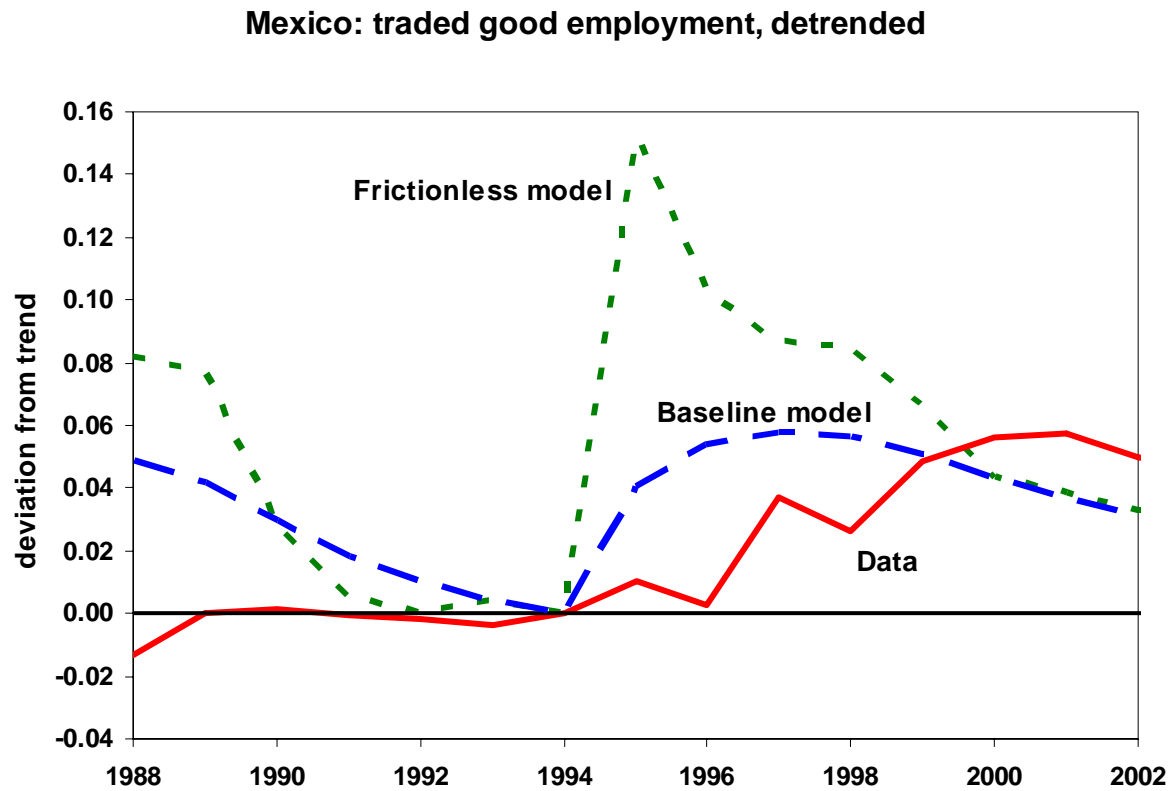
Mexico: sectoral value added



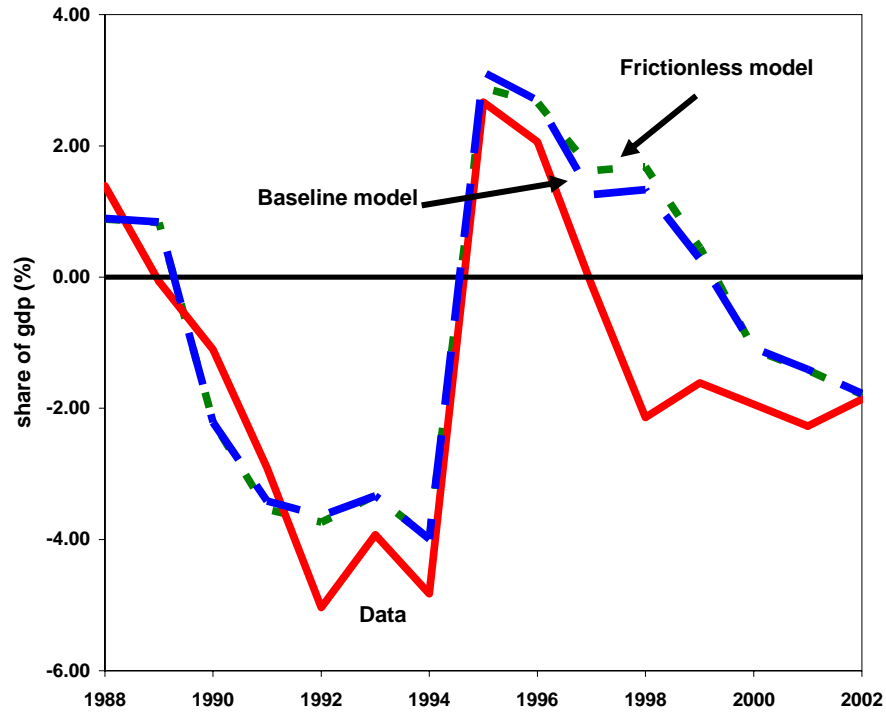
Data

# How important are labor frictions?

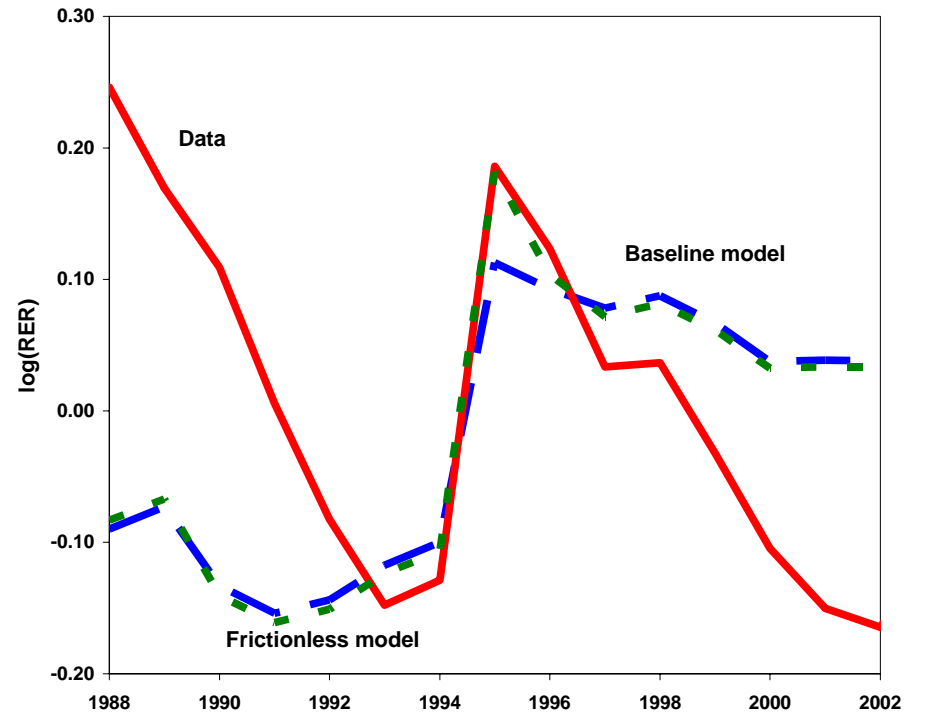
- Remove labor frictions, leave all else unchanged.



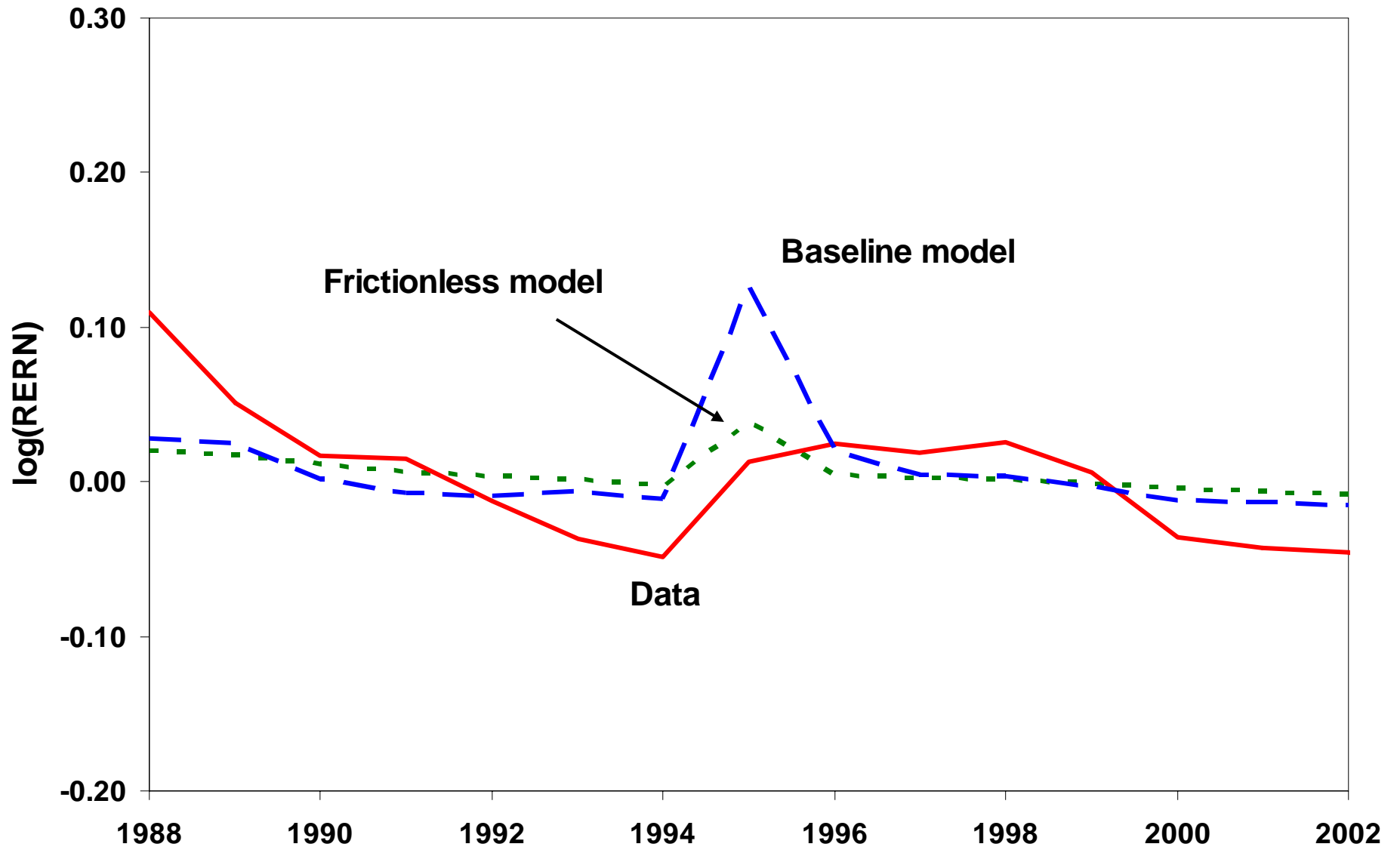
Mexico: trade balance



Mexico: real exchange rates



# Mexico: nontraded/traded good prices



## Variable Capital Utilization

- law of motion

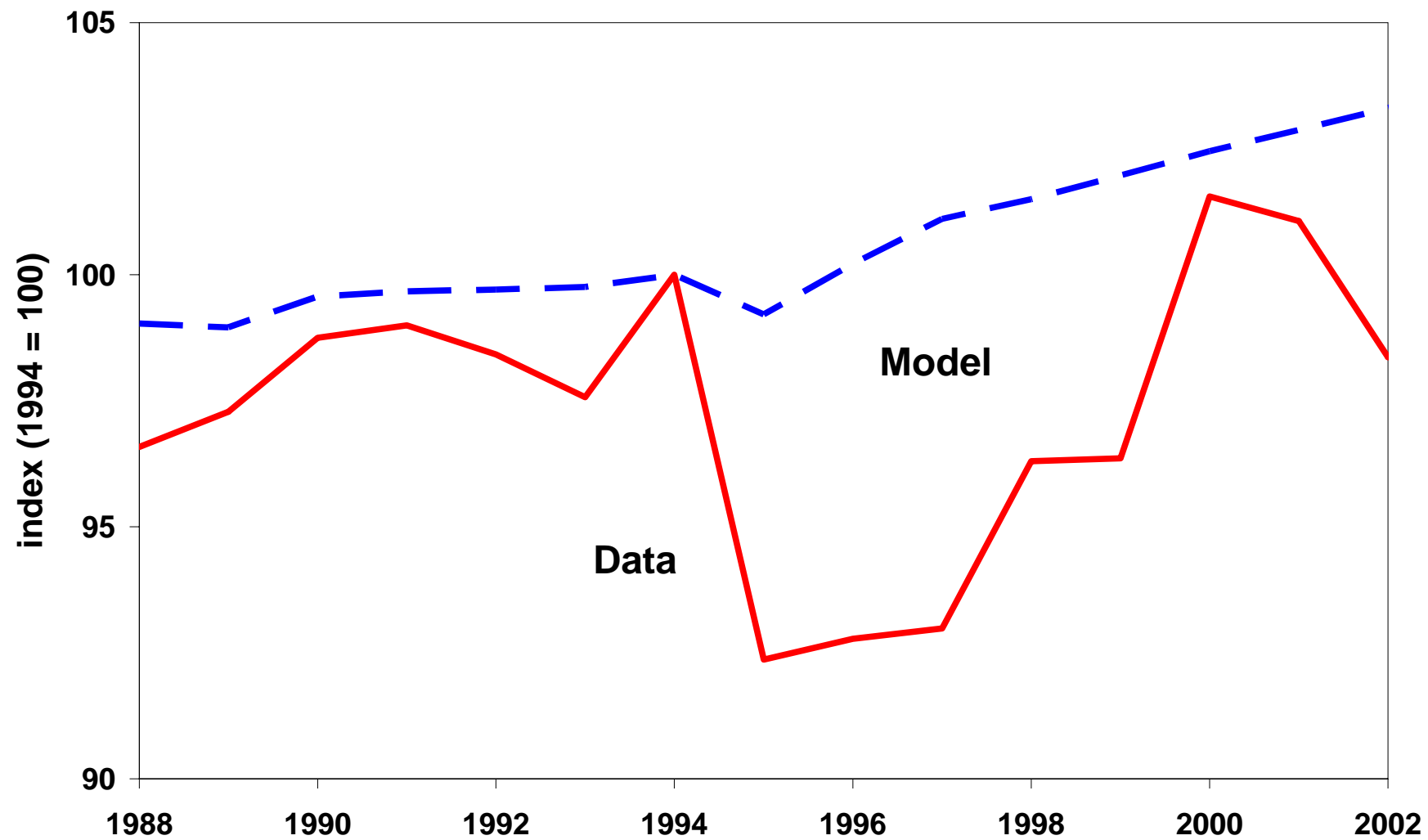
$$k_{D,t+1} = \left(1 - \phi^{-1} u_{D,t}^{\phi}\right) k_{D,t} + i_{D,t}$$

$$k_{N,t+1} = \left(1 - \phi^{-1} u_{N,t}^{\phi}\right) k_{N,t} + i_{N,t}$$

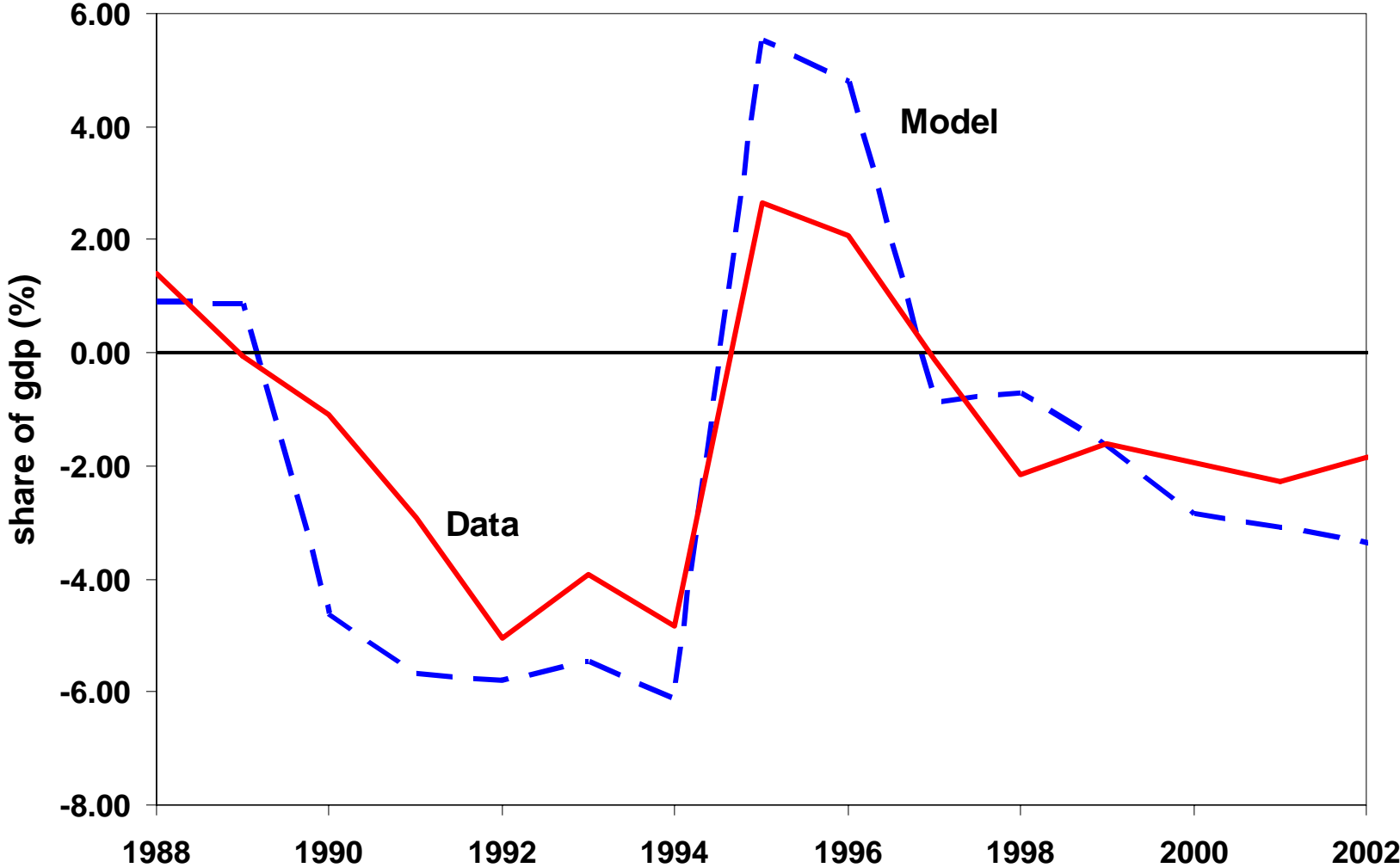
- during crisis utilization of nontradable capital falls
- standard growth accounting:

falling utilization = falling *TFP*

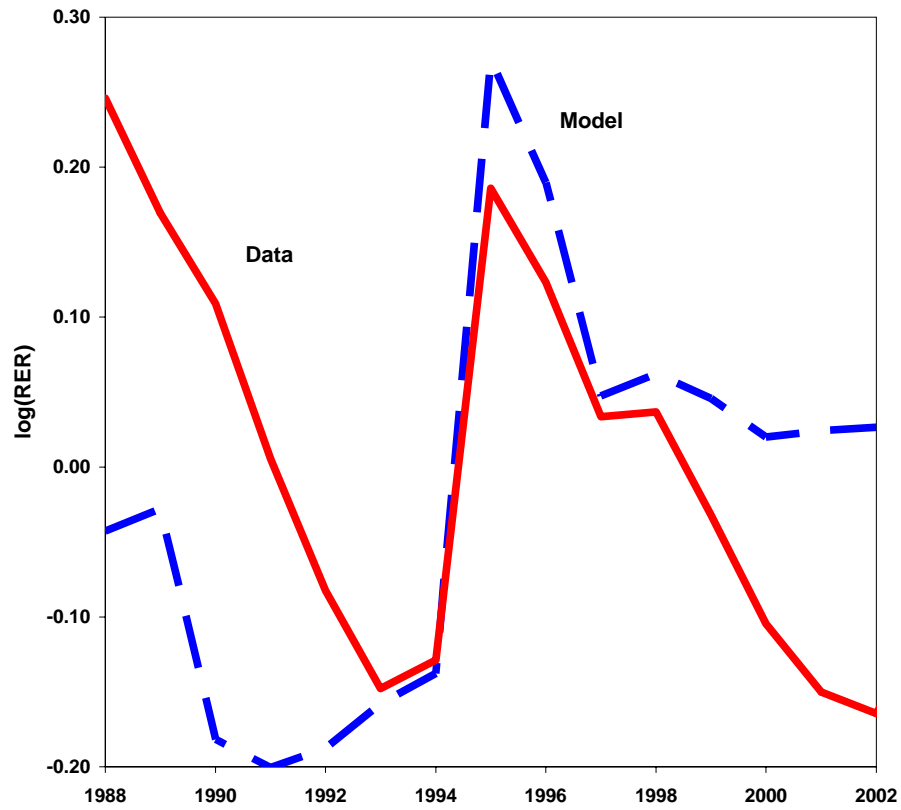
## Mexico: Total Factor Productivity



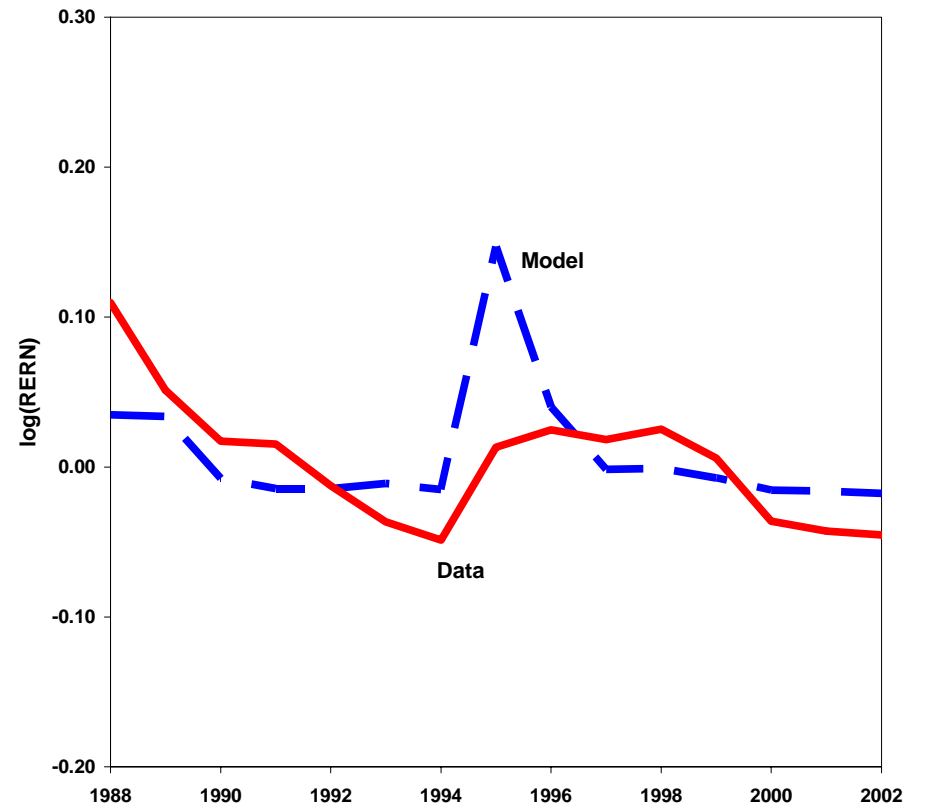
# Mexico: trade balance



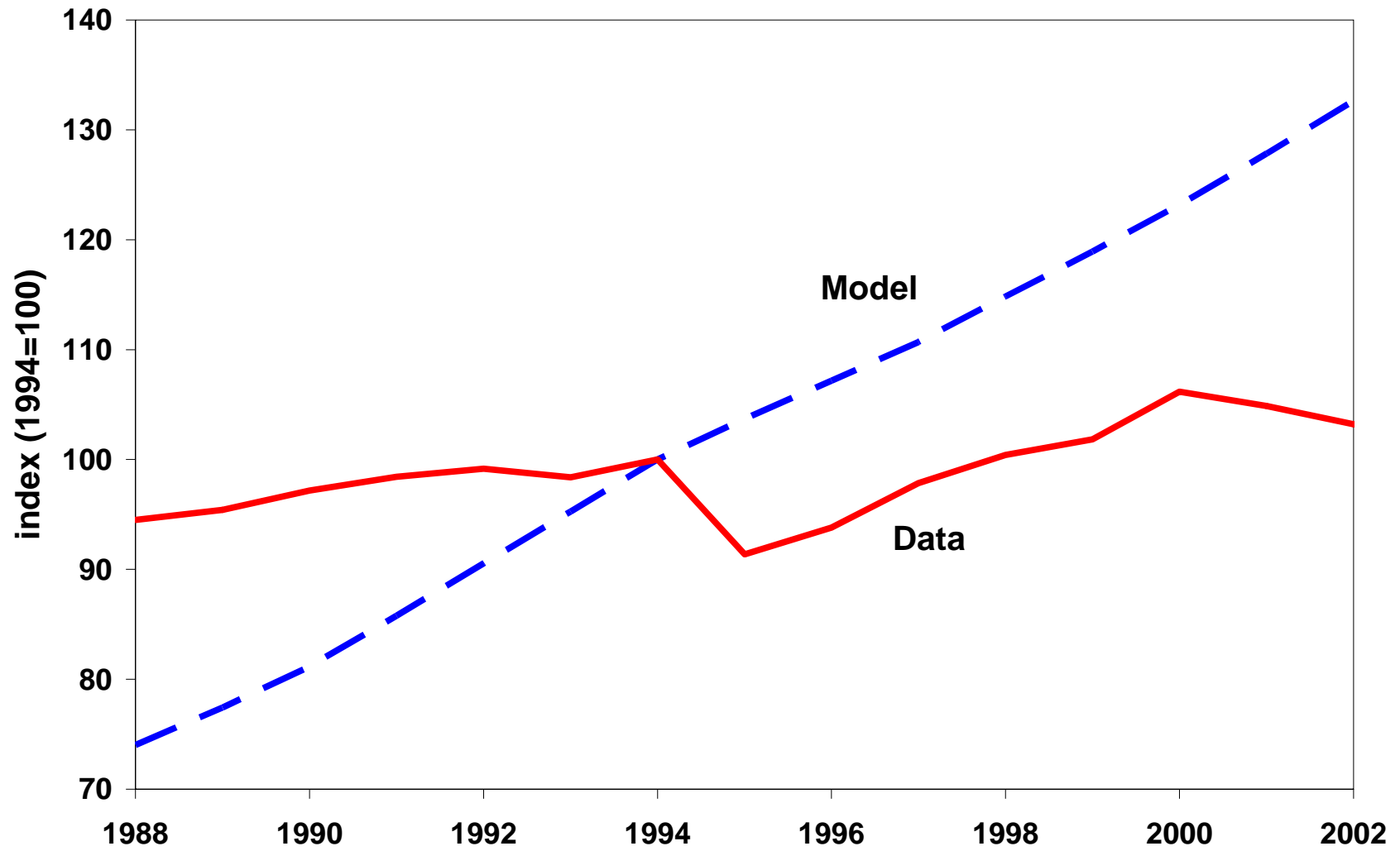
Mexico: real exchange rates



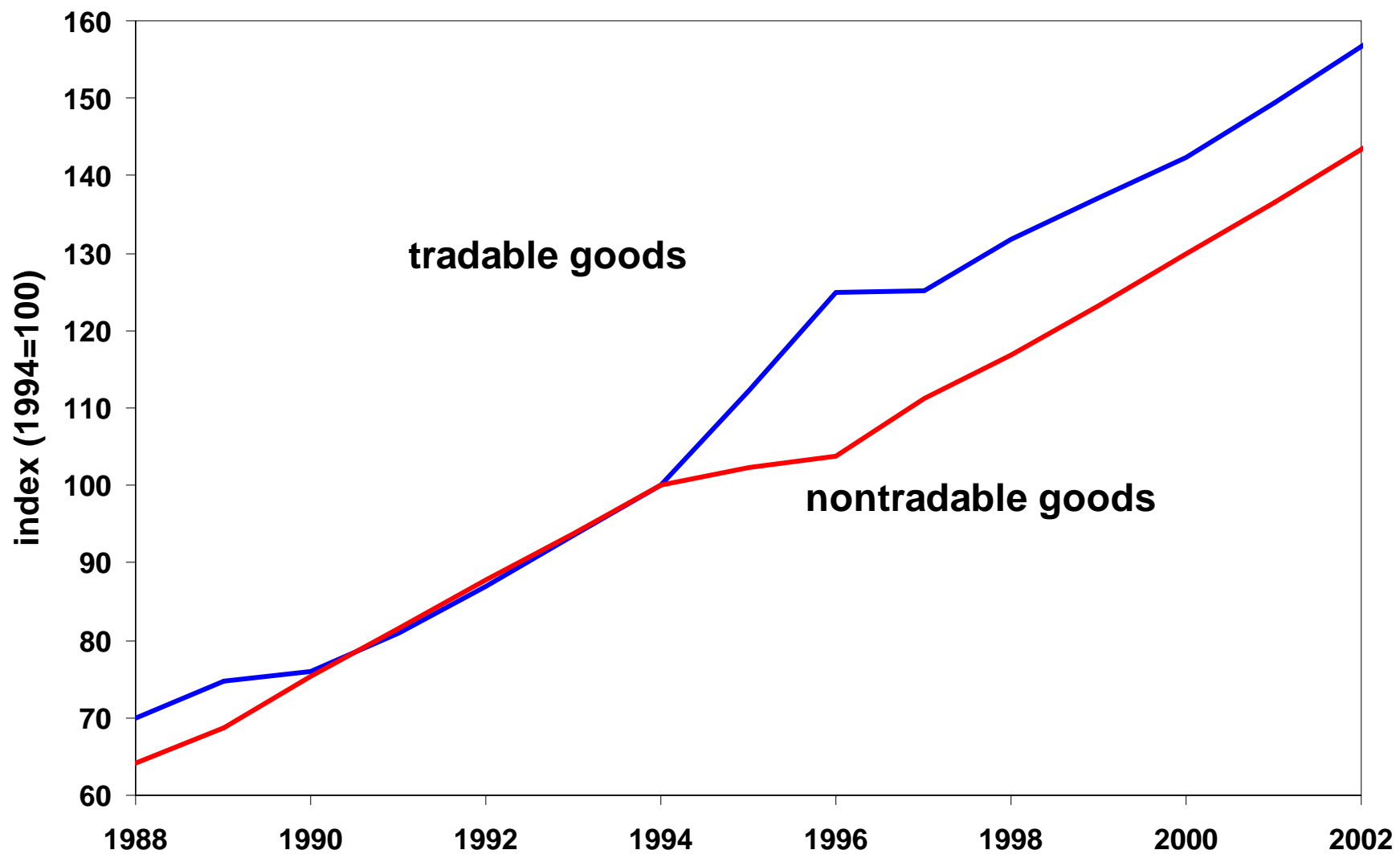
Mexico: nontraded/traded good prices



## Mexico: GDP per working age person



# Mexico: sectoral value added



## Accounting for GDP

- Take TFP drop as exogenous
- robustness check: TFP drops **DO NOT** cause sudden stops

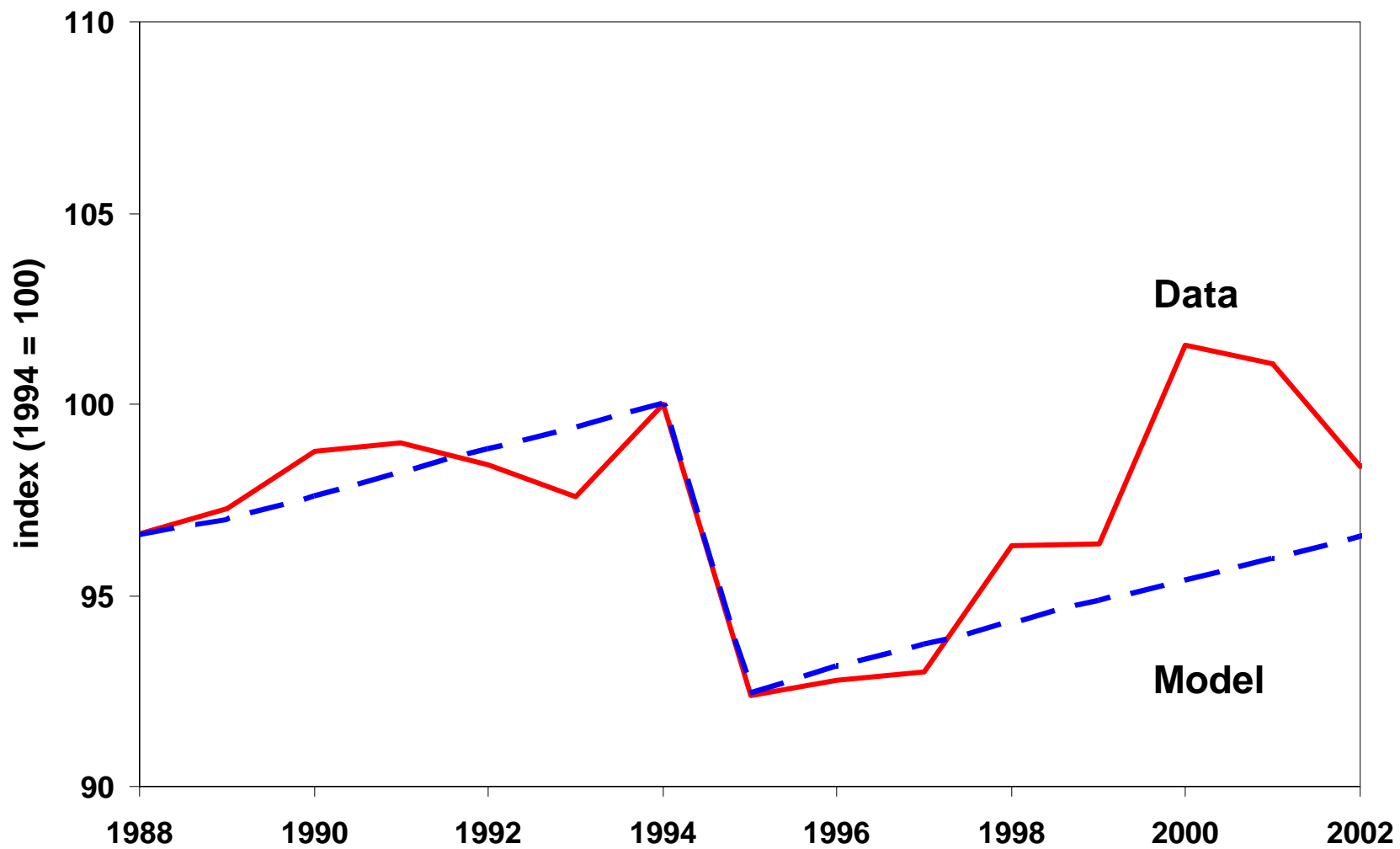
$$y_{D\tau} = \min \left[ z_{TD\tau} / a_{TD}, z_{ND\tau} / a_{ND}, A_D k_{D\tau}^{\alpha_D} \left( (v_\tau \gamma)^\tau \ell_{D\tau} \right)^{1-\alpha_D} \right] - \Theta_D (\ell_{D\tau-1}, \ell_{D\tau}) \ell_{D\tau-1}$$

$$y_{N\tau} = \min \left[ z_{TN\tau} / a_{TN}, z_{NN\tau} / a_{NN}, A_N k_{N\tau}^{\alpha_N} \left( (v_\tau \gamma)^\tau \ell_{N\tau} \right)^{1-\alpha_N} \right] - \Theta_N (\ell_{N\tau-1}, \ell_{N\tau}) \ell_{N\tau-1}$$

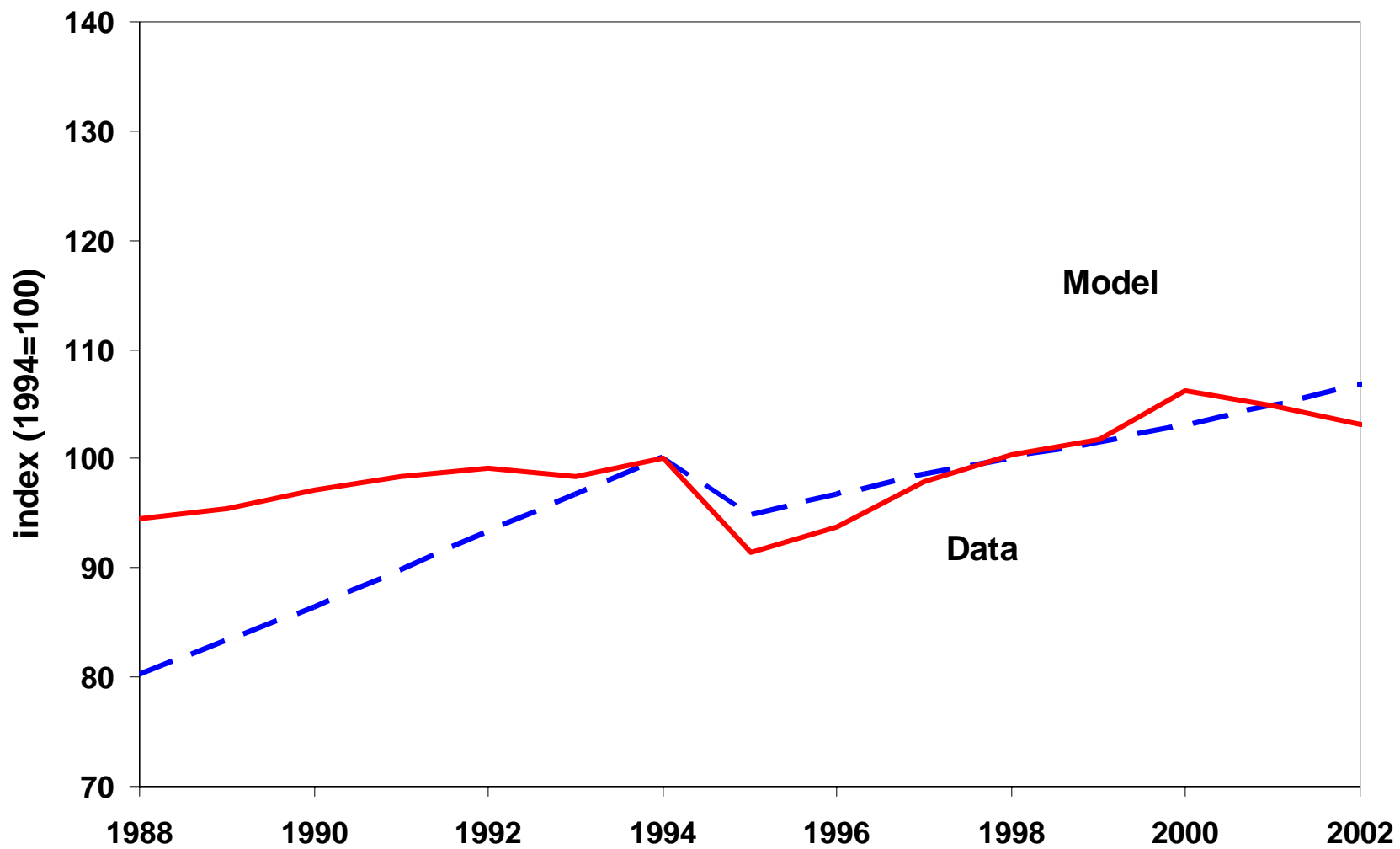
$$v_t = \begin{cases} 1.0 & t < 1995 \\ 0.86 & t \geq 1995 \end{cases}$$

- All else same

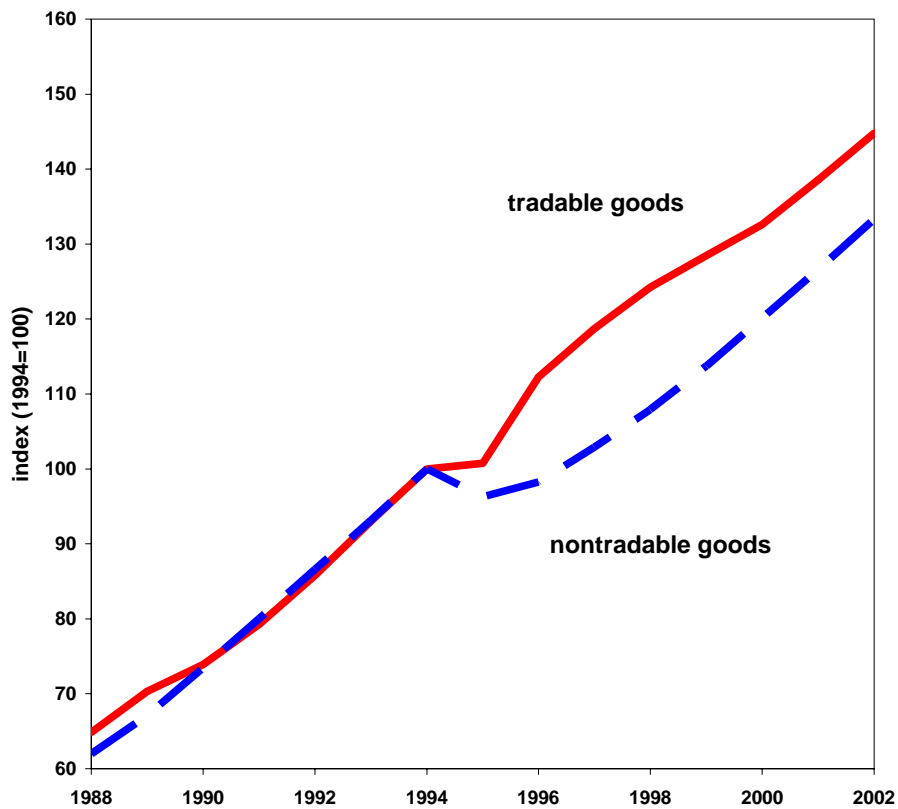
## Mexico: Total Factor Productivity



## Mexico: GDP per working age person

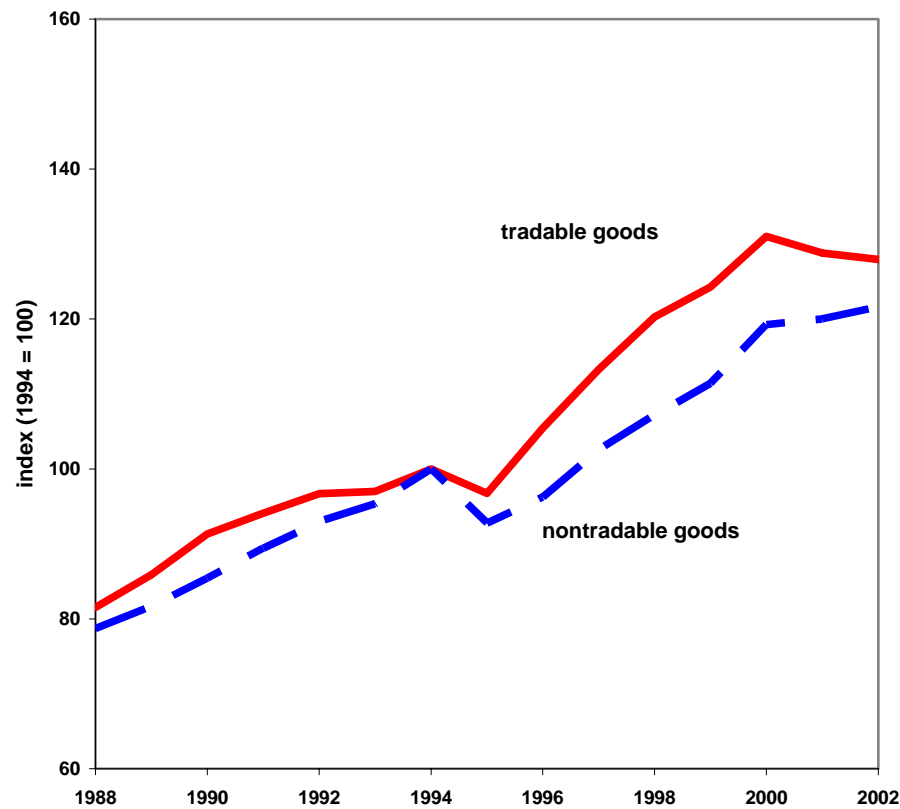


Mexico: sectoral value added



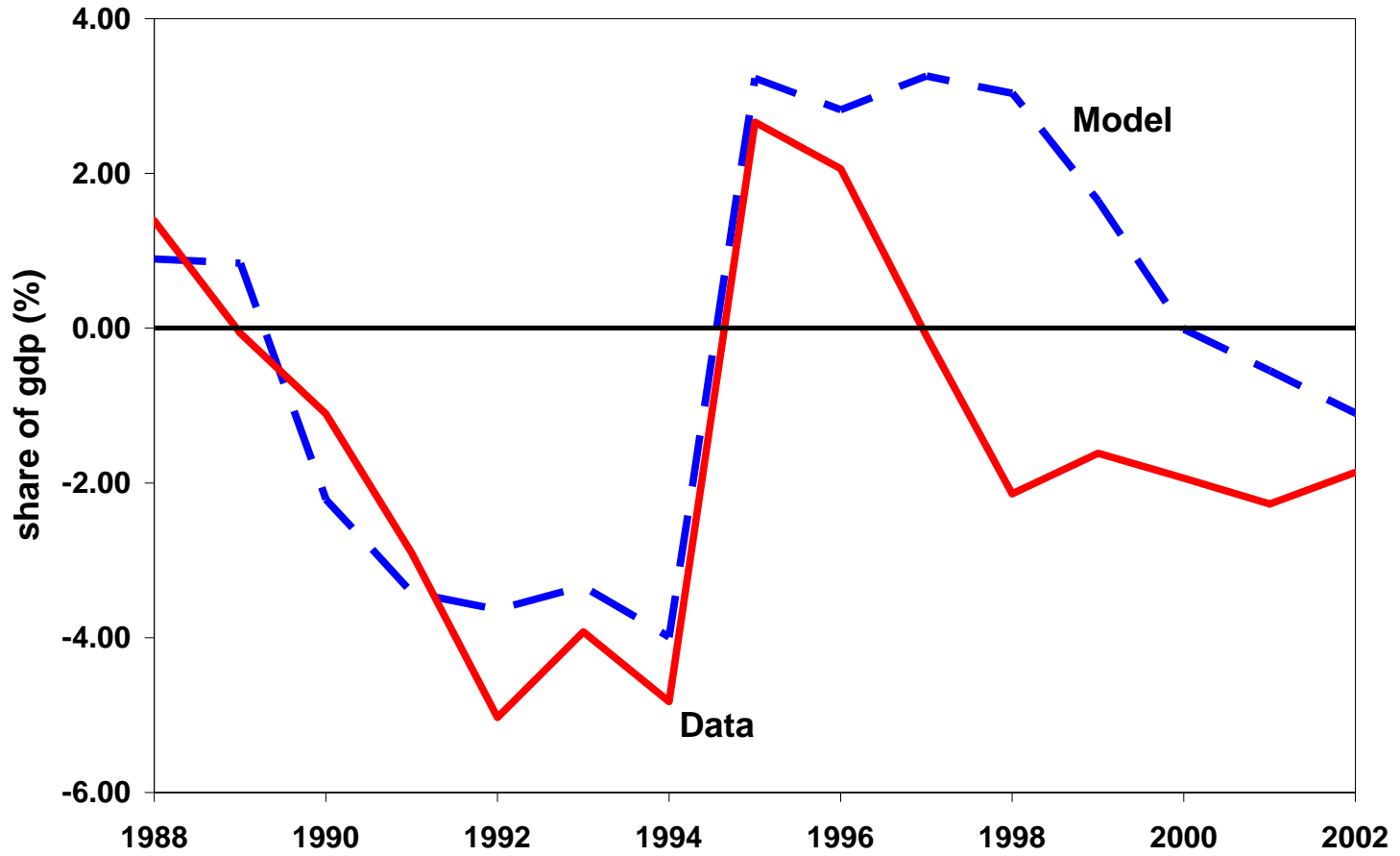
Model

Mexico: sectoral value added

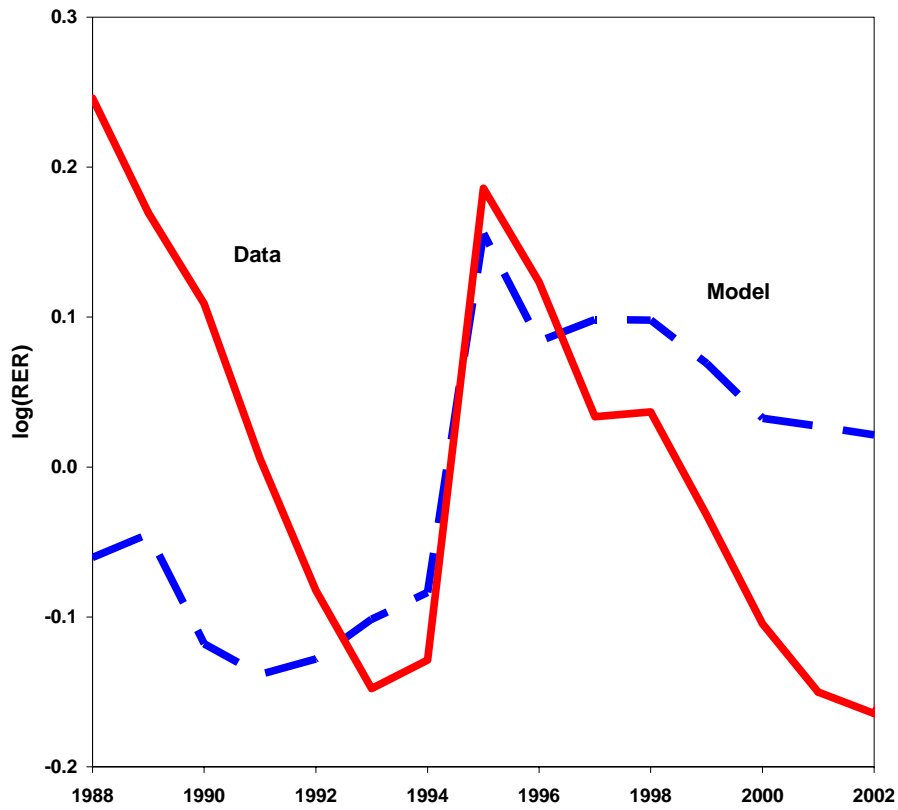


Data

### Mexico: trade balance



Mexico: real exchange rates



Mexico: nontraded/traded good prices

