What Can We Learn From the Current Crisis in Argentina?

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The economy of Argentina finds itself submerged in a great depression that, even if though began four years ago, deepened after mid 2001 with average quarterly falls of deseasonalized GDP with respect to the previous quarter of 5 percent for the last two quarters of 2001 and the first of 2002. This violent deepening of the recession occurred just at the moment that economic agents, almost universally, became convinced of the impossibility of sustaining the Convertibility Plan.

Dirección Nacional de Coordinación de Políticas Macroeconómicas, Secretaría de Política Económica (2002)

What Happened in Argentina in 2001-2002?

The Brazilian devaluation did not lead to problems for the Argentinian current account — both exports and the trade surplus in fact grew.

March 16 2001: President De la Rúa rejected the plan presented by the Minister of the Economy, Ricardo López Murphy, to reduce the fiscal deficit.

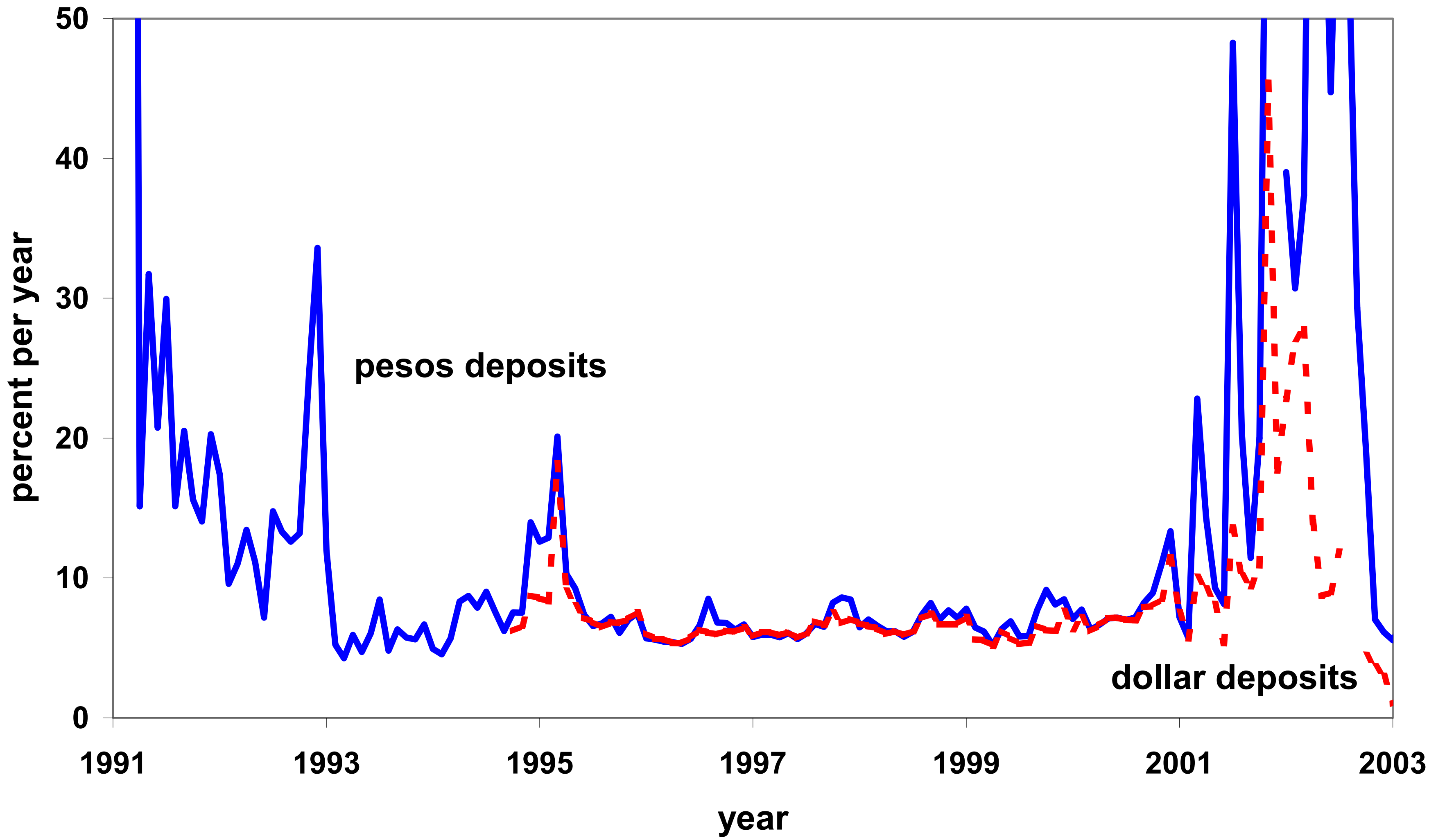
After López Murphy's resignation, De la Rúa appointed Domingo Cavallo, the architect of the Convertibility Plan during the first Menem administration, as Minister of the Economy.

Cavallo presented a new economic plan in the lower house of Argentina’s congress. On 28 March 2001, the congress refused to allow Cavallo to cut government salary and pension costs, and the government sold debt to cover the deficit.

Cavallo’s alternative: La Ley de Déficit Cero (Zero Deficit Act): Quasi Monies.

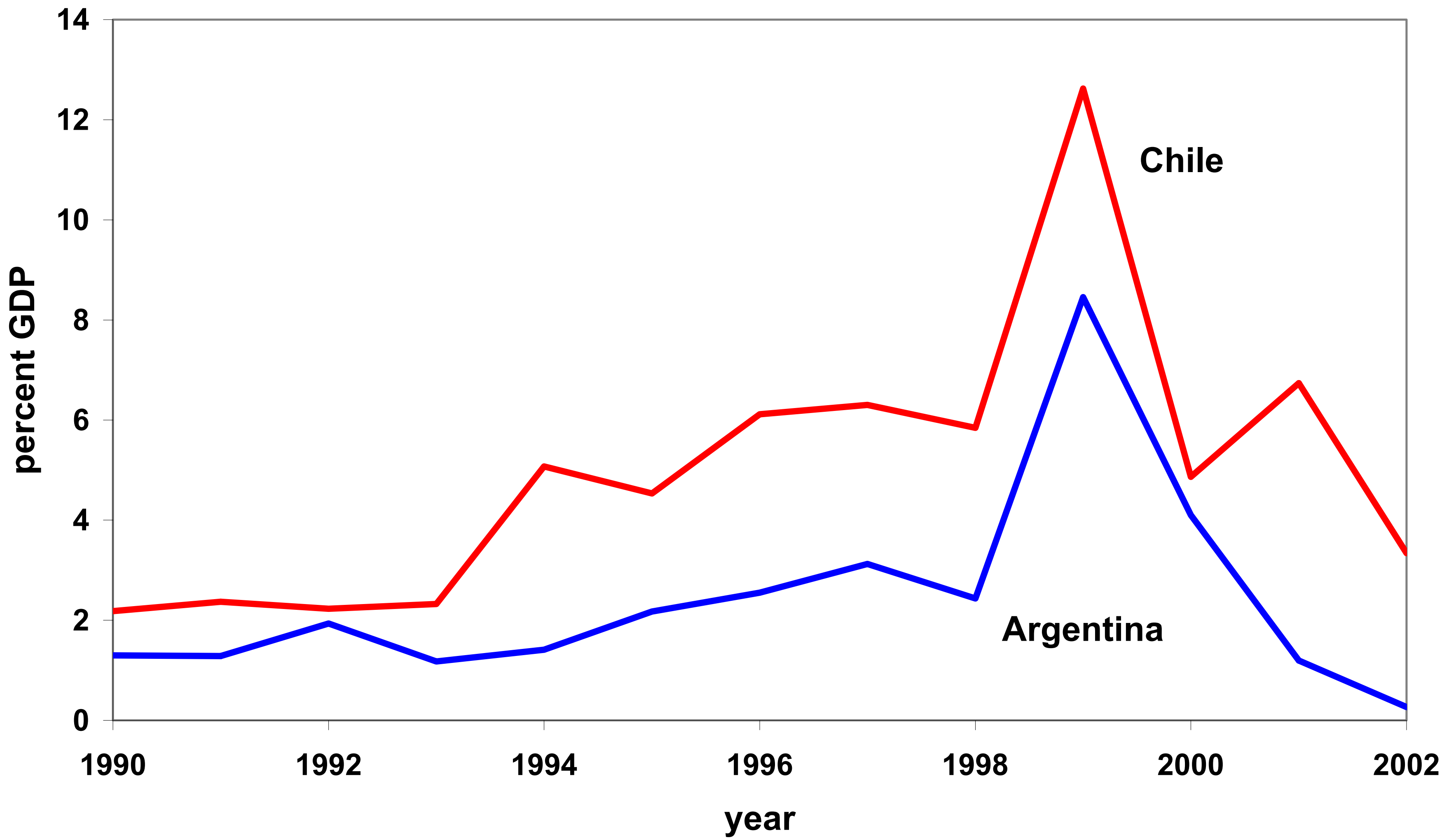
In December 2001, the government defaulted on its debt and, in January 2002, it abandoned the Convertibility Plan.

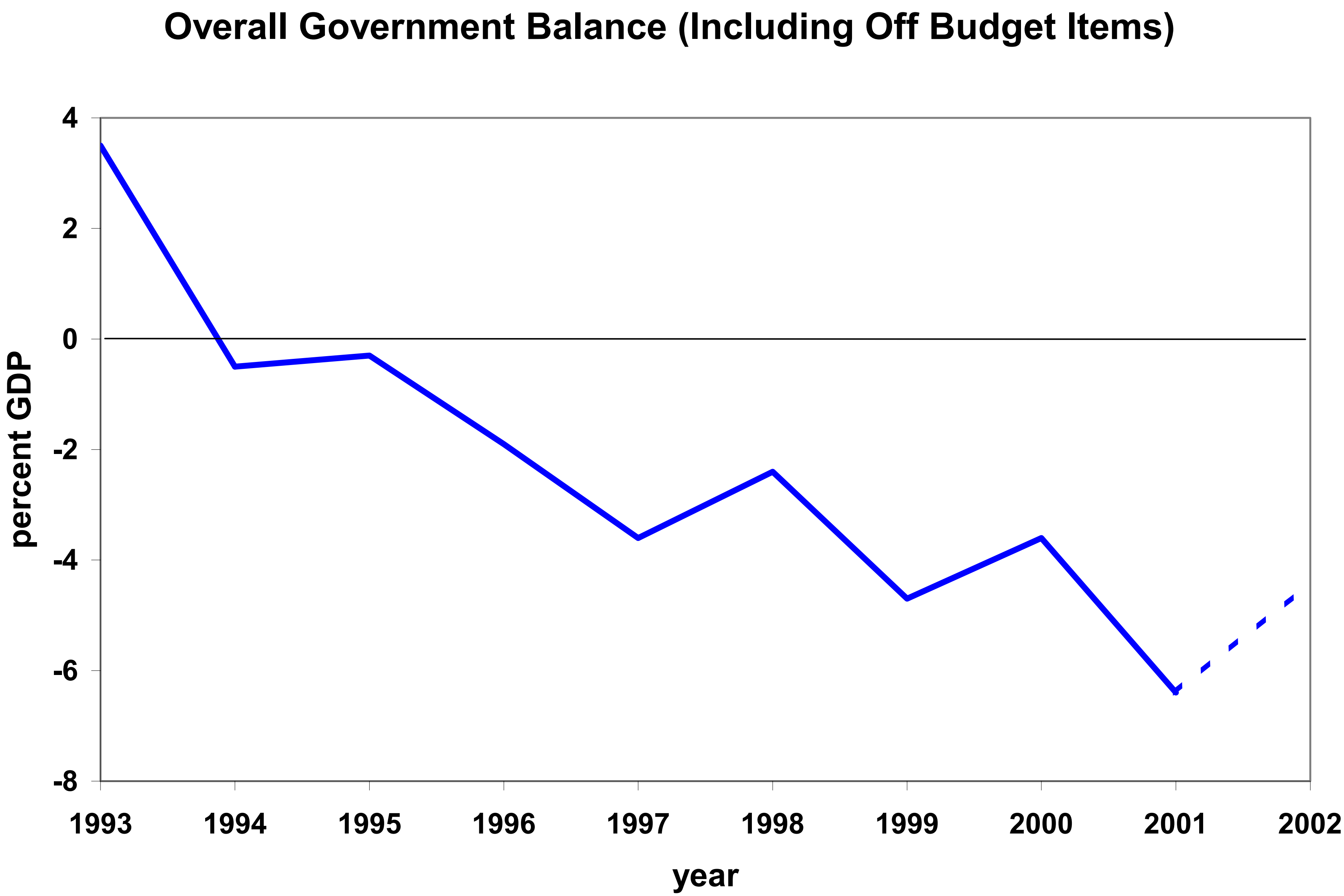
Money Market Interest Rates




Trade in Goods and Services
30
25
20
15
10
5
0
percent GDP
exports
imports
1990
1992
1994
1996
1998
2000
2002
year

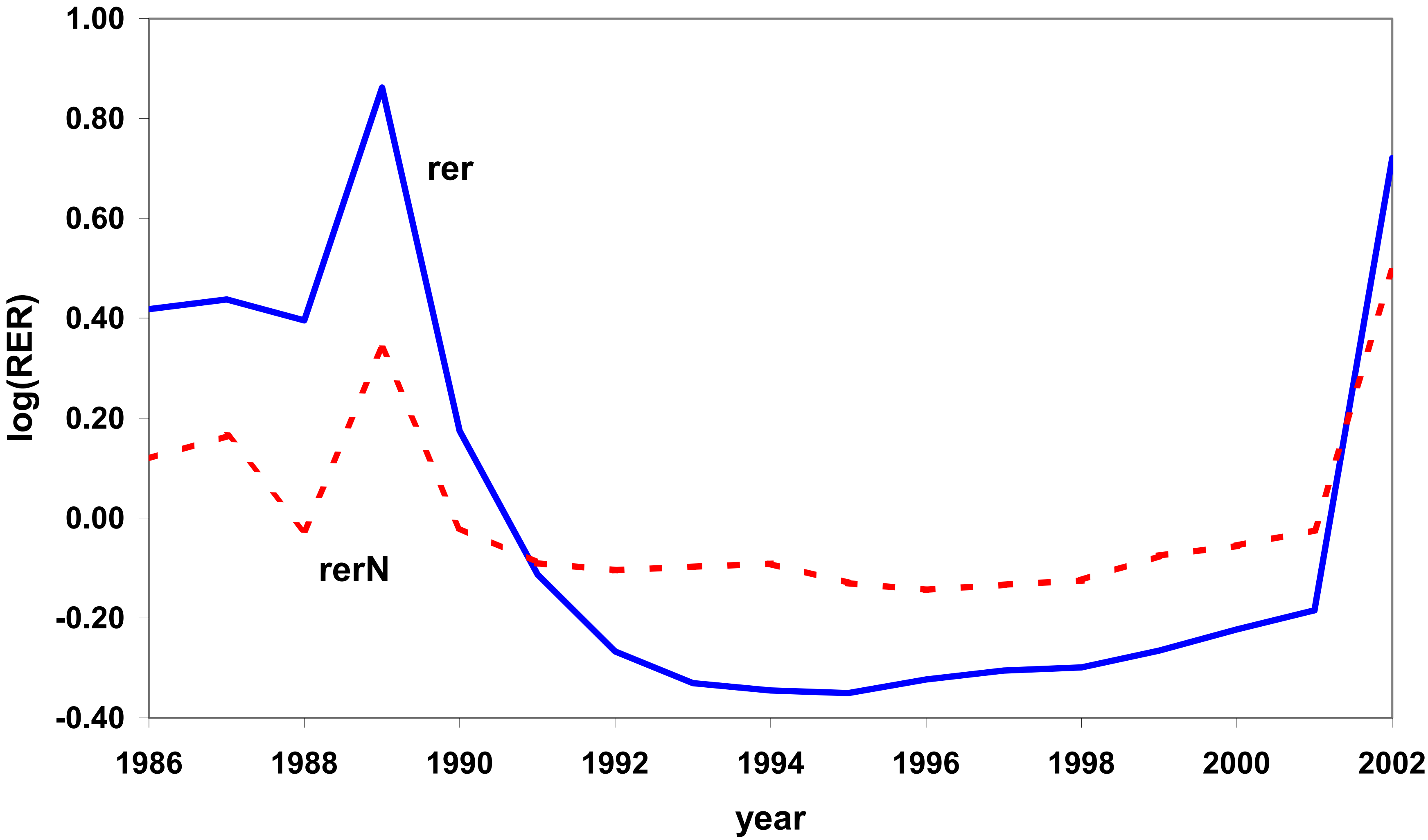
Inward Foreign Direct Investment

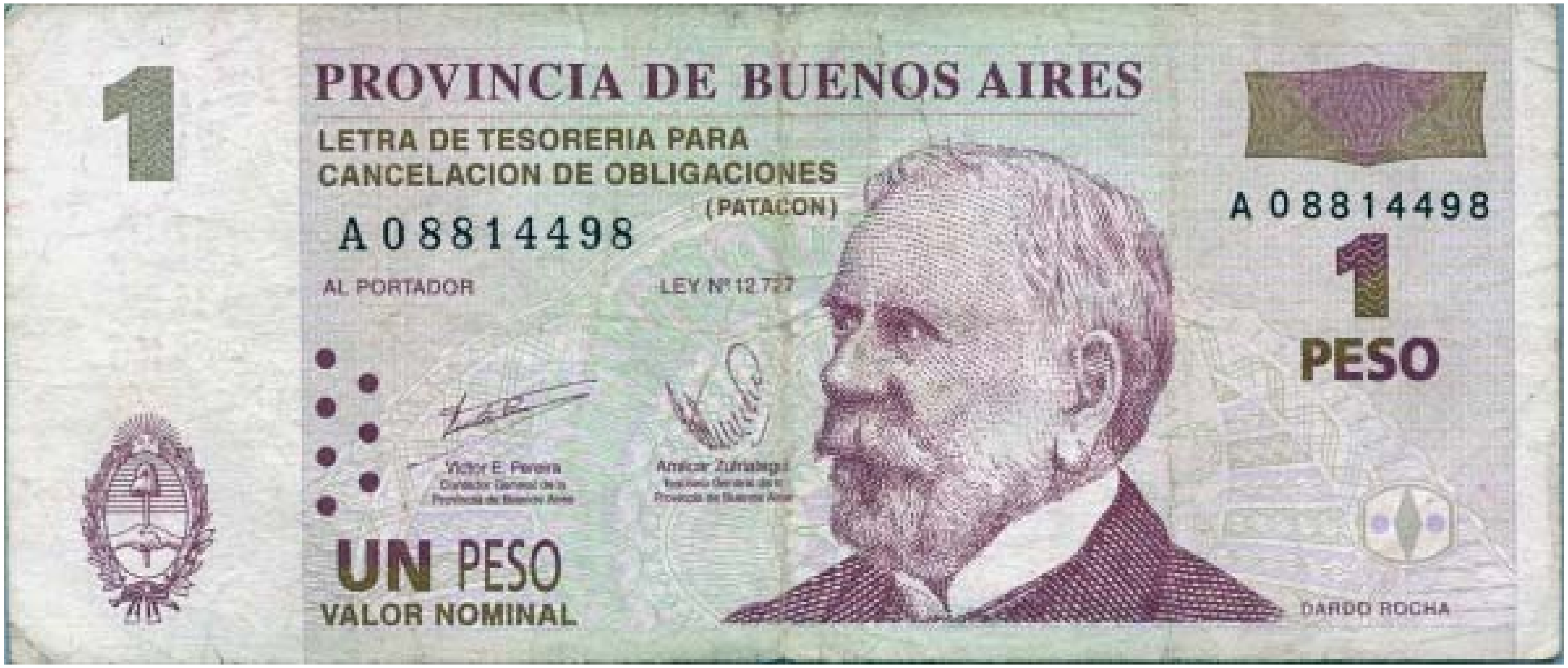



Overall Government Balance (Including Off Budget Items)
percent GDP
4
2
0
-2
-4
-6
-8
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
year


Argentina External Debt/GDP
175
150
125
100
75
50
25
0
percent
1986
1988
1990
1992
1994
1996
1998
2000
2002
year

Argentina-U.S. Real Exchange Rate

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PROVINCIA DE BUENOS AIRES
LETRA DE TESORERIA PARA
CANCELACION DE OBLIGACIONES
(PATACON)
A 08814498
AL PORTADOR
LEY Nº 12.727
Victor E. Pereira
Amilcar Zufriategui
UN PESO
VALOR NOMINAL
A 08814498
1
PESO
DARDO ROCHA


1
LEY Nº 12.727
ARTICULO 1º : "Declárase en estado de emergencia administrativa, económica y financiera al Estado Provincial..."
ARTICULO 7º : "Apruébase la emisión de Letras de Tesorería para Cancelación de Obligaciones, las que se denominarán "Patacón"... Los títulos serán emitidos bajo las modalidades de los Artículos 742, 744 y 745 del Código de Comercio."
ARTICULO 8º : "Las Letras de Tesorería para Cancelación de Obligaciones pagarán el ciento siete por ciento (107%) de su valor nominal el 25 de julio de 2002... Las Letras de Tesorería serán nominadas en pesos..."
ARTICULO 11º : "El pago efectuado al acreedor mediante Patacones o Bonos de Cancelación de Obligaciones, importará la extinción irrevocable de los créditos por los que se efectúa la entrega."
1
PESO

Great Depressions of the Twentieth Century Project

Use growth accounting and applied dynamic equilibrium models to reexamine great depression episodes:

United Kingdom (1920s and 1930s) — Cole and Ohanian
Canada (1930s) — Amaral and MacGee
France (1930s) — Beaudry and Portier
Germany (1930s) — Fisher and Hornstein
Italy (1930s) — Perri and Quadrini
Argentina (1970s and 1980s) — Kydland and Zarazaga
Chile and Mexico (1980s) — Bergoeing, Kehoe, Kehoe, and Soto
Japan (1990s) — Hayashi and Prescott

**(Review of Economic Dynamics, January 2002
revised and expanded version forthcoming
as Minneapolis Fed volume)**

Lessons from Great Depressions Project

- The main determinants of depressions are not drops in the inputs of capital and labor — stressed in traditional theories of depressions — but rather drops in the efficiency with which these inputs are used, measured as total factor productivity (TFP).
- Exogenous shocks like the deteriorations in the terms of trade and the increases in foreign interest rates that buffeted Chile and Mexico in the early 1980s can cause a decline in economic activity of the usual business cycle magnitude.
- Misguided government policy can turn such a decline into a severe and prolonged drop in economic activity below trend — a great depression.

Applied dynamic general equilibrium model

The representative consumer maximizes

$$\sum_{t=1980}^{\infty} \beta^t \left[\gamma \log C_t + (1-\gamma) \log(\bar{h} N_t - L_t) \right]$$

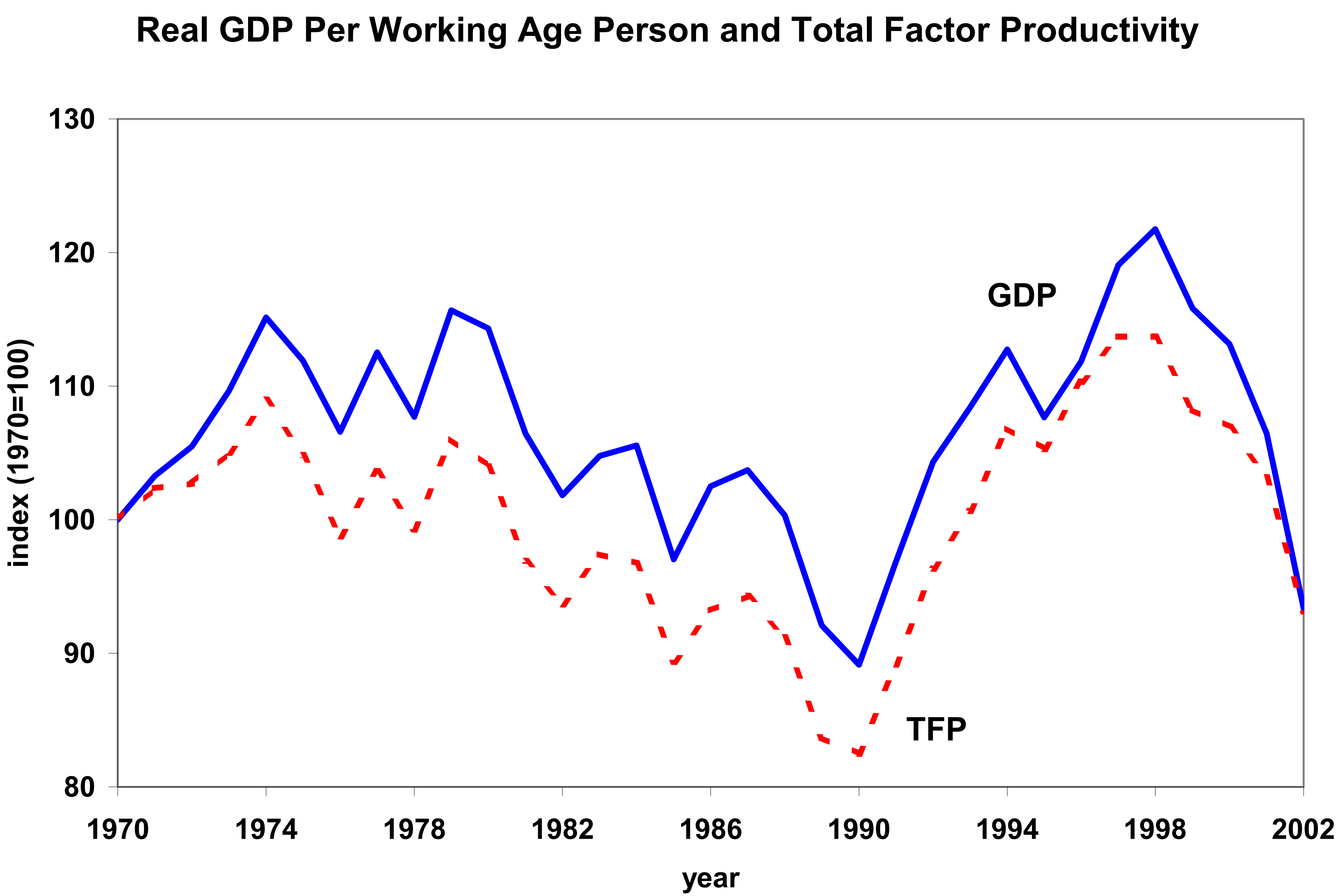
subject to

$$C_t + K_{t+1} - K_t = w_t L_t + (r_t - \delta) K_t .$$

Feasibility:

$$C_t + K_{t+1} - (1-\delta) K_t = A_t K_t^{\alpha} L_t^{1-\alpha} .$$


Argentina: Real GDP per working age person
800
400
200
100
50
1900
1920
1940
1960
1980
2000
index (1900=100)
year



Real GDP Per Working Age Person and Total Factor Productivity
130
120
110
100
90
80
index (1970=100)
GDP
TFP
1970
1974
1978
1982
1986
1990
1994
1998
2002
year

Calibration

First order conditions:

$$\frac{1}{C_{t-1}} = \frac{\beta}{C_t}\left(1 + r_t - \delta\right)$$

$$\frac{1-\gamma}{\bar{h}N_t - L_t} = \frac{\gamma\, w_t}{C_t}.$$

Estimate $\beta = 0.96$, $\gamma = 0.30$ 1960-1970 data.

Model with Adjustment Costs

$$C_t + X_t = A_t K_t^{\alpha} L_t^{1-\alpha}$$

$$K_{t+1} = (1-\delta)K_t + \phi(X_t / K_t)K_t$$

where

$$\phi(X/K) = \left[\delta^{1-\eta}(X/K)^{\eta} + (\eta-1)\delta\right]/\eta.$$

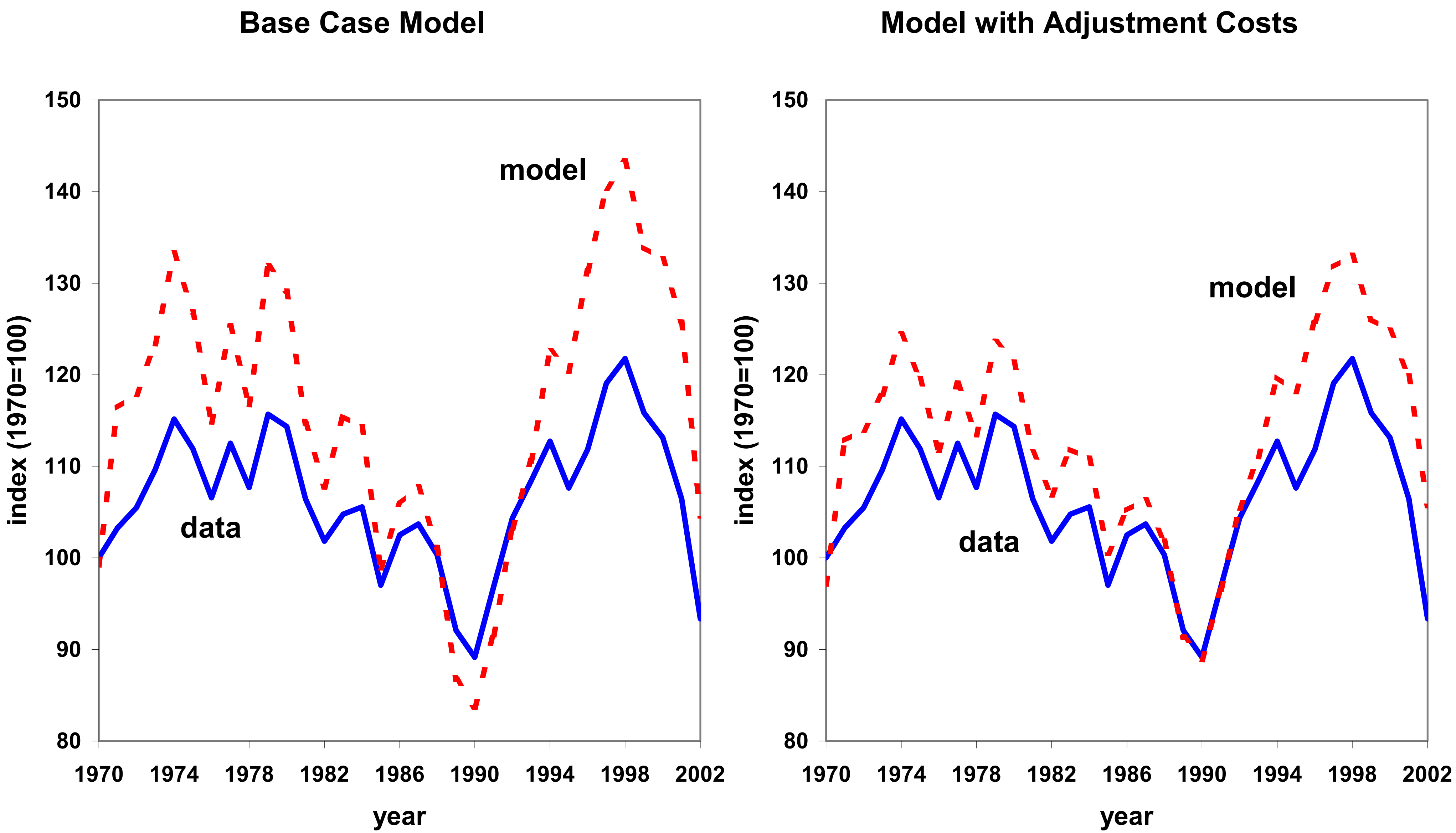
For $0<\eta\leq 1$, $\phi'(X/K)>0$, $\phi''(X/K)\leq 0$, $\phi(\delta)=\delta$, $\phi'(\delta)=1$.

The model without adjustment costs is the special case $\eta=1$.

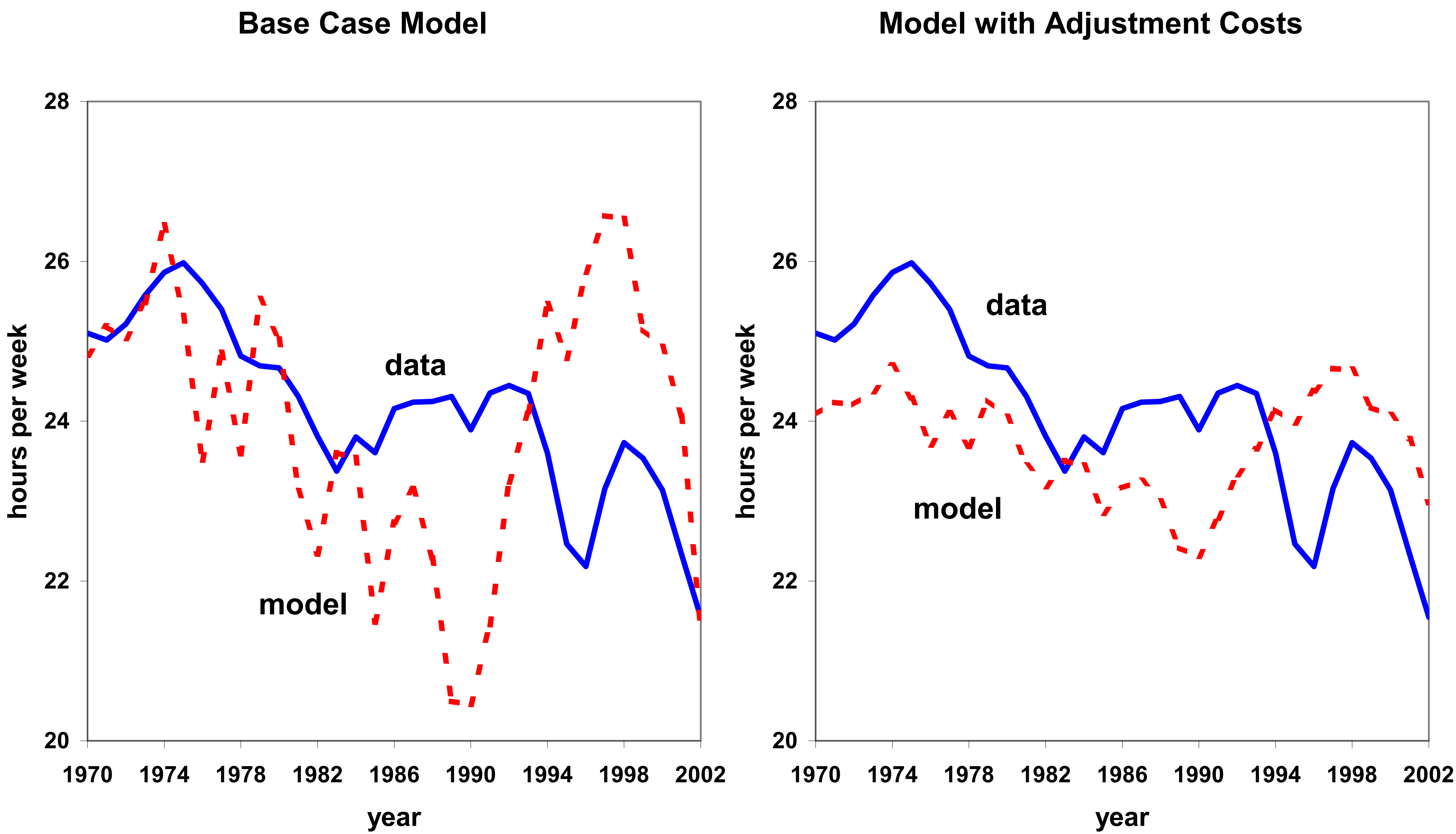
In numerical experiments $\eta=0.8$.

Should we model rigidity in the labor market (instead)?

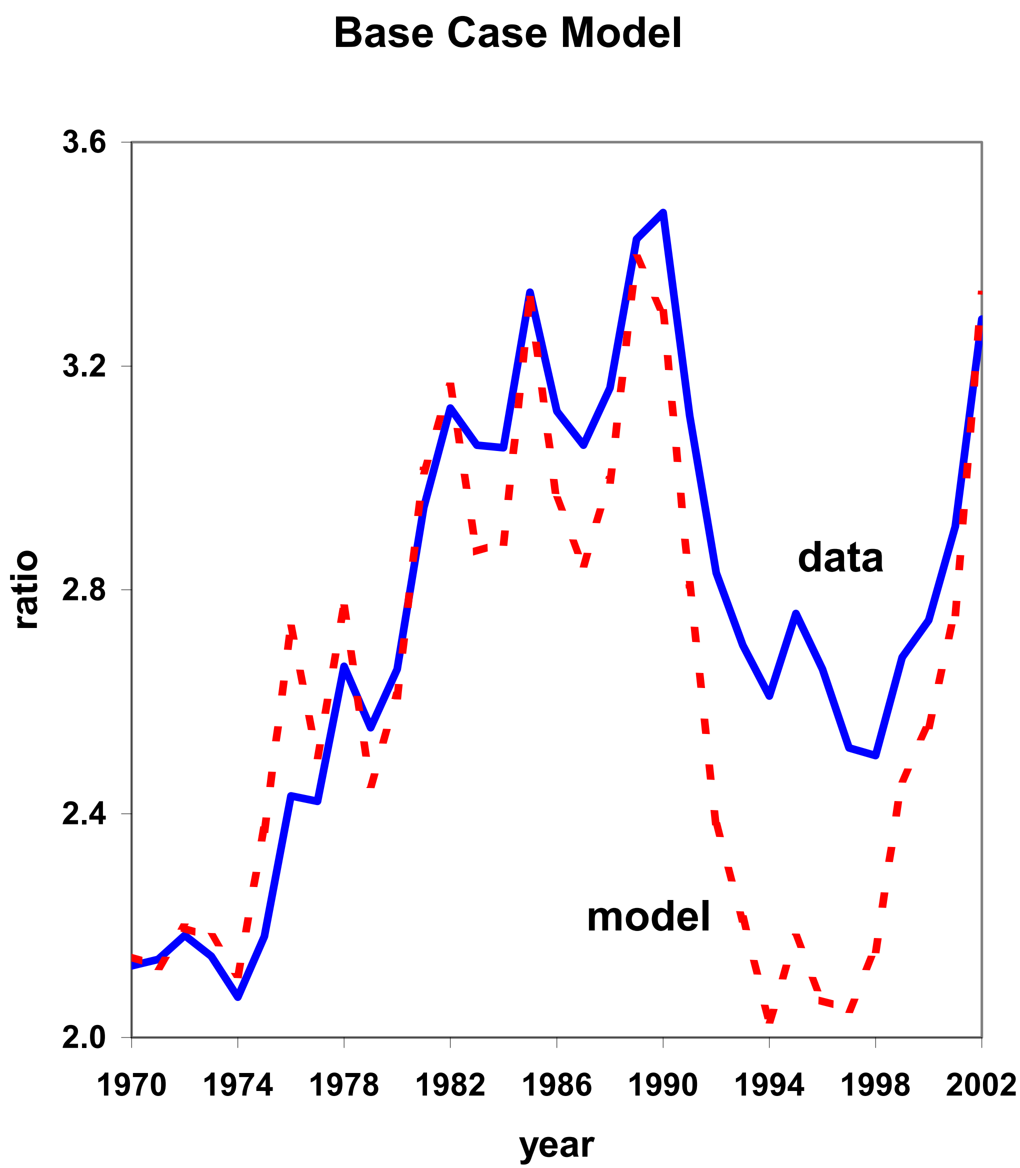
Real GDP per Working- Age Person

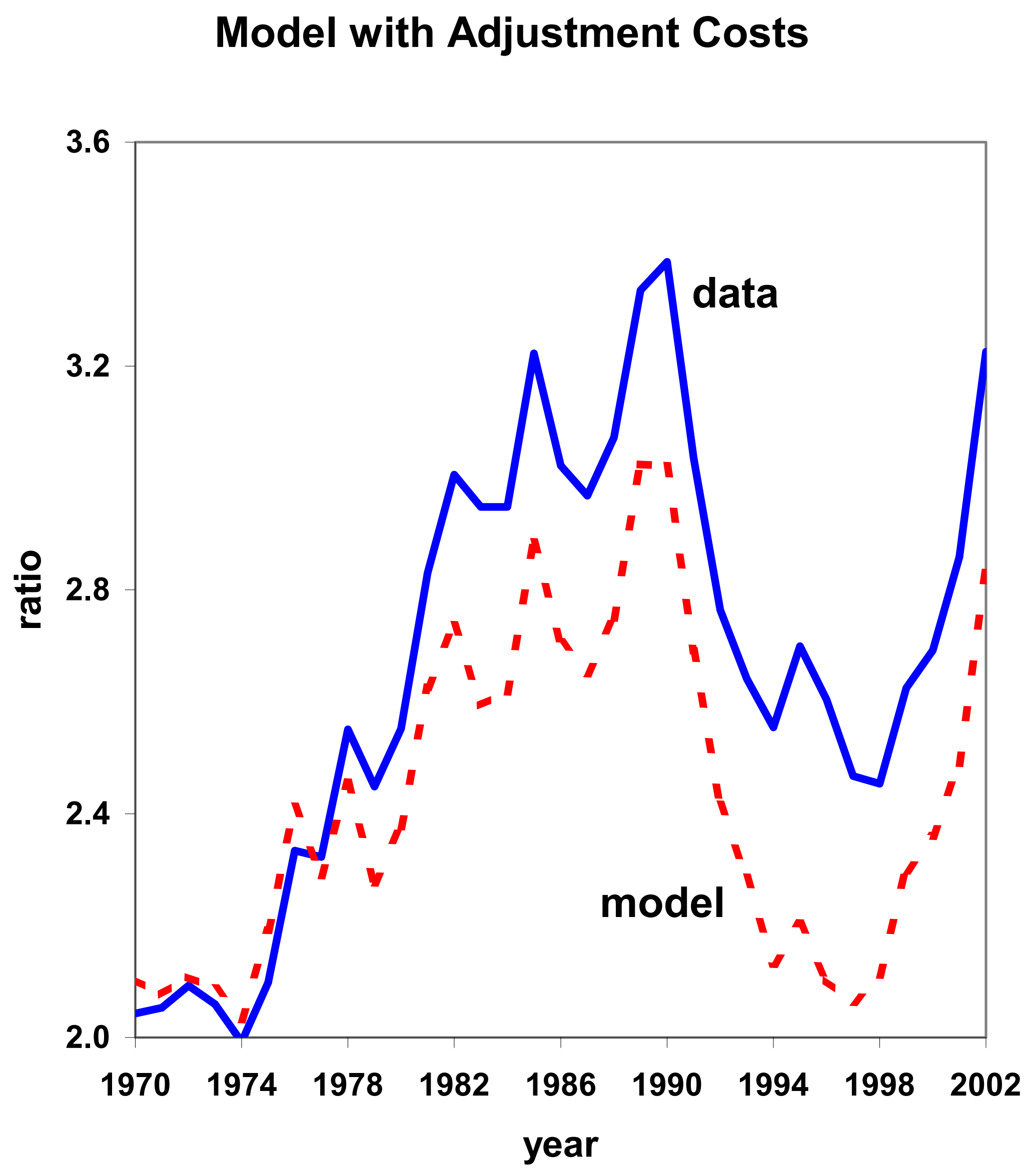


Hours Worked per Working-Age Person

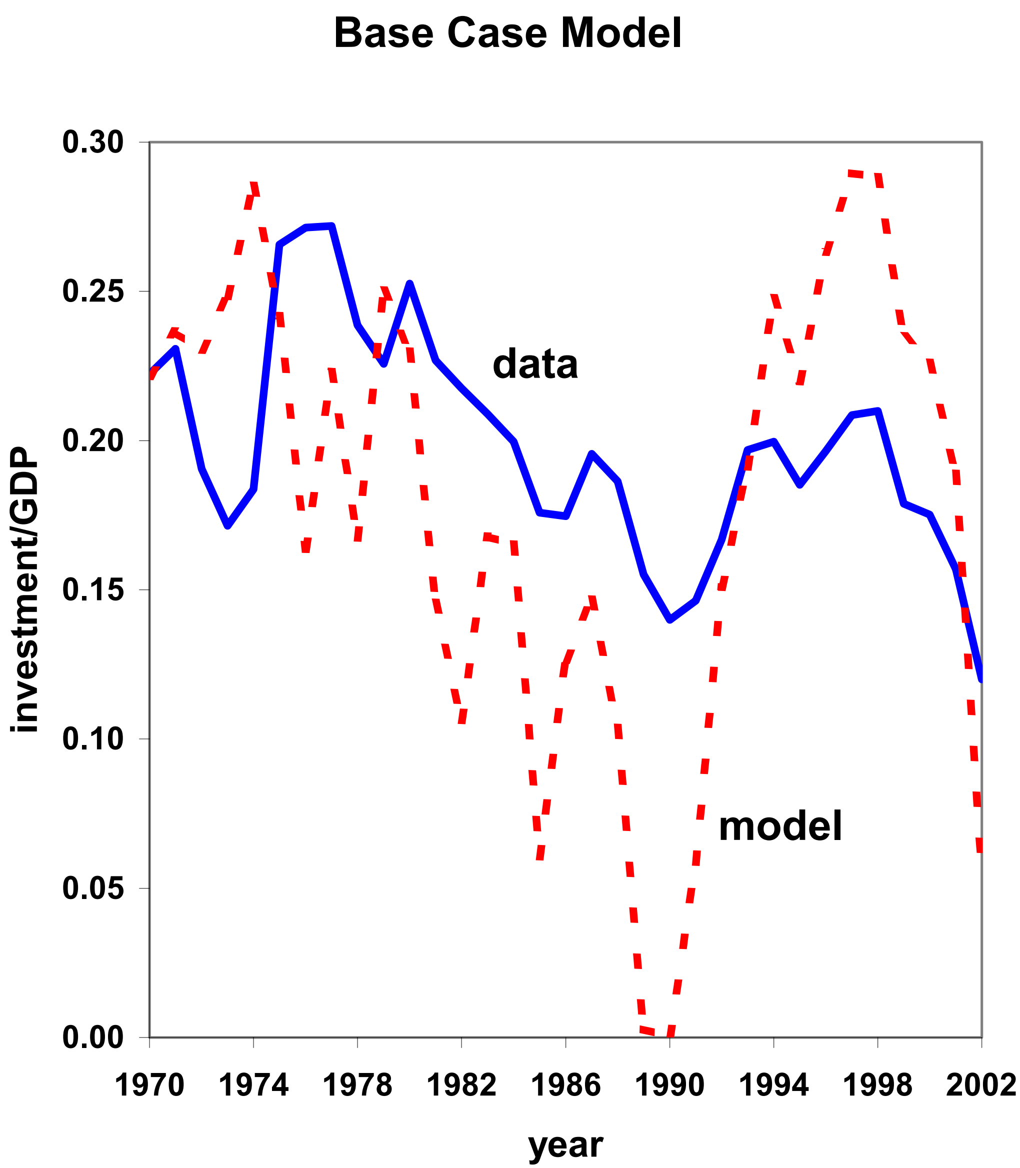


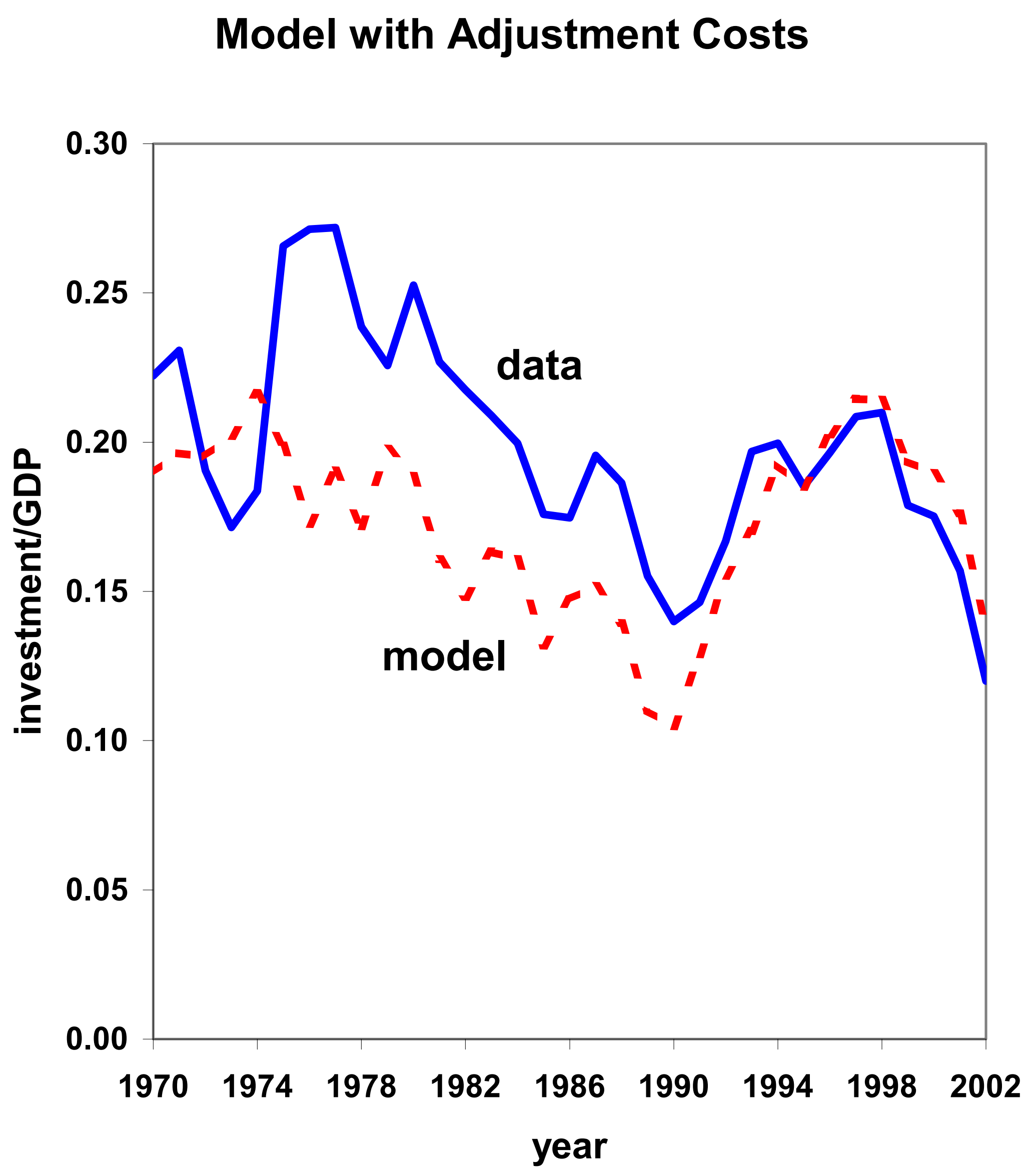
Capital-Output Ratio





Investment Rate





Mexico: 1988-2000

One-sector growth model

maximize $\sum_{t=1988}^{\infty} \beta^t \left[\gamma \log C_t + (1-\gamma) \log(\bar{h} N_t - L_t) \right]$

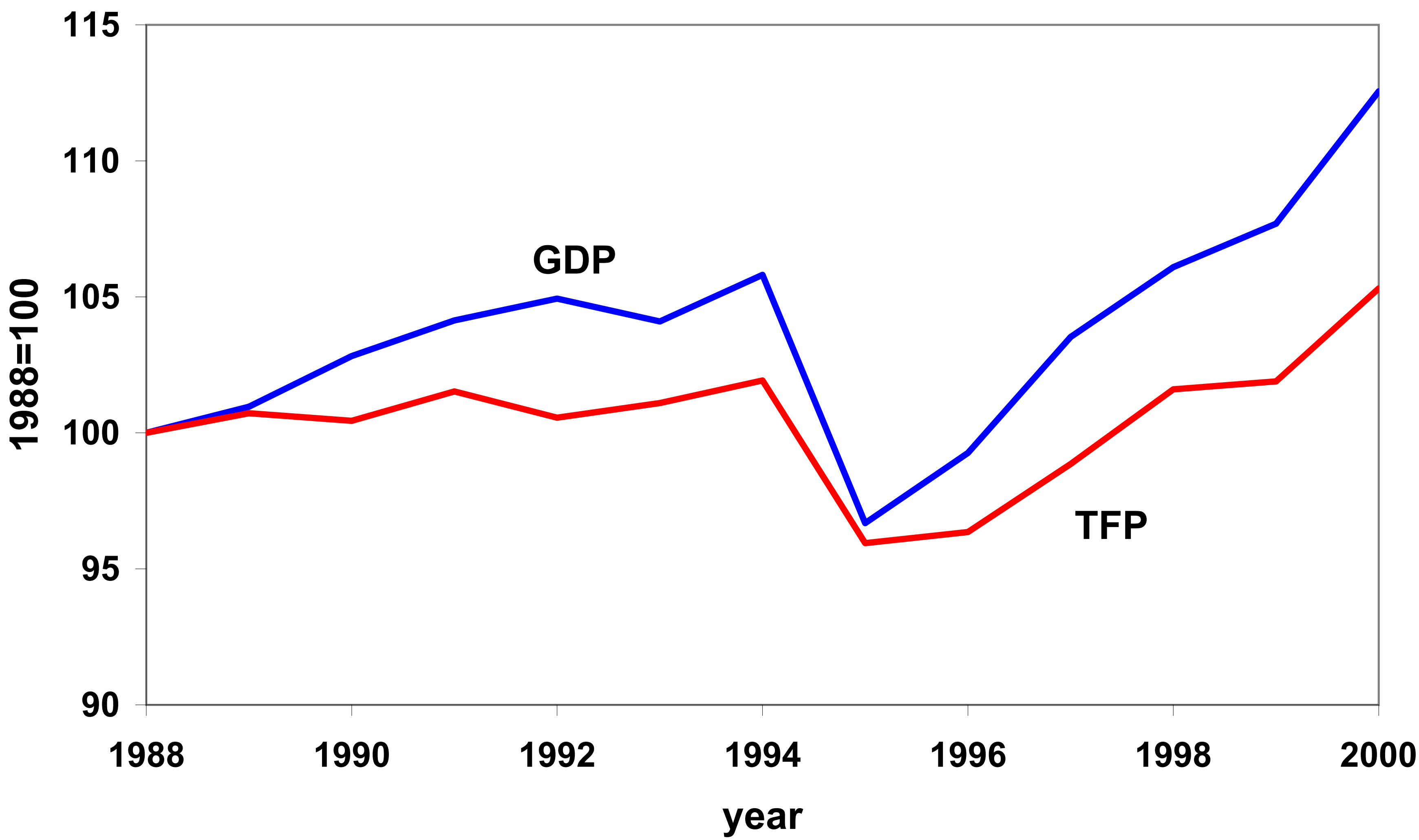
subject to $C_t + K_{t+1} - K_t = w_t L_t + (1-\tau_t)(r_t - \delta) K_t + T_t - X_t$

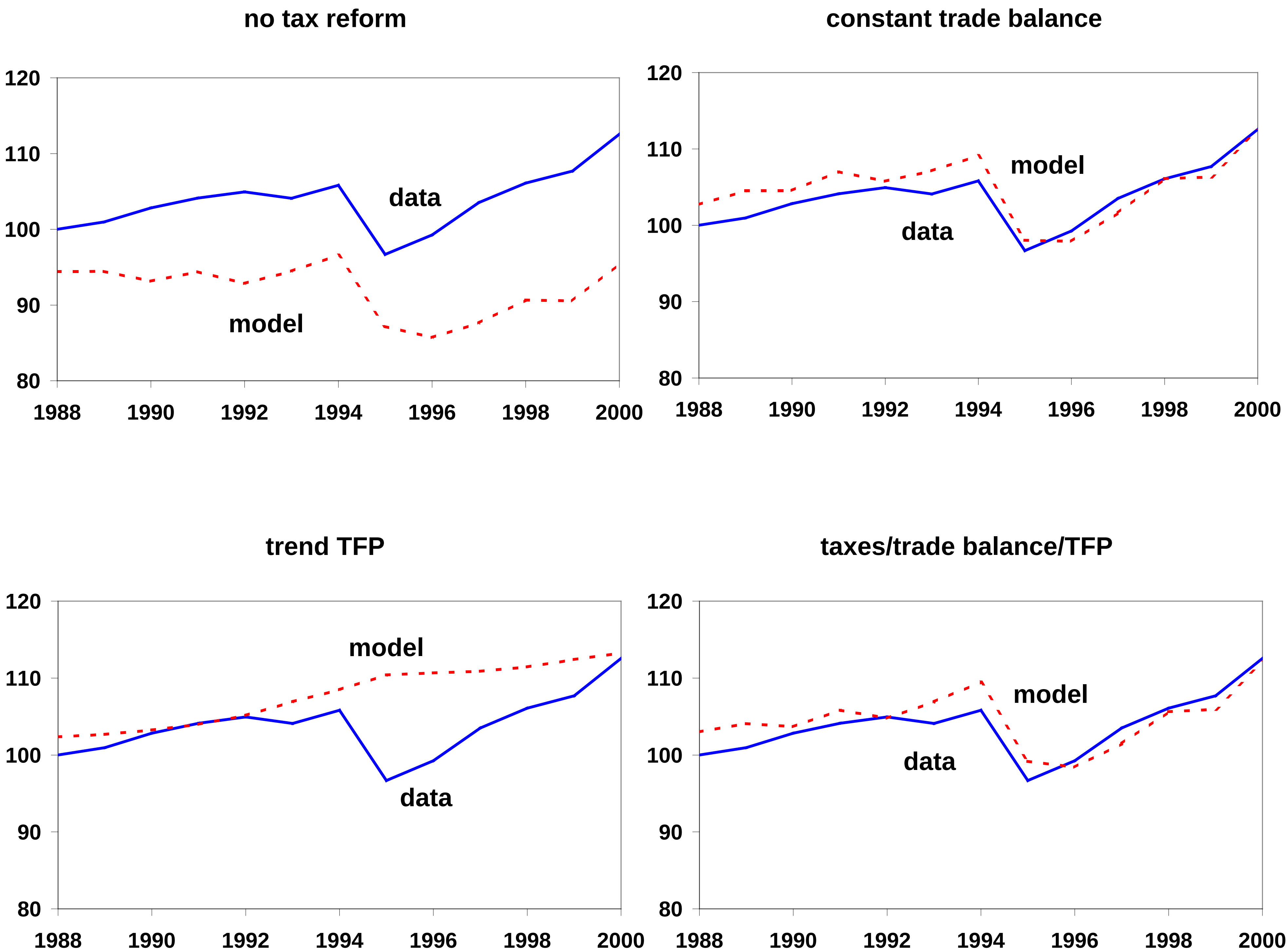
feasibility constraint

$$C_t + K_{t+1} - (1-\delta) K_t + X_t = A_t K_t^{\alpha} L_t^{1-\alpha}.$$

A_t and X_t are treated as exogenous.

Real GDP per Working Age (15-64) person and TFP in Mexico




no tax reform
data
model
constant trade balance
model
data
trend TFP
model
data
taxes/trade balance/TFP
model
data
120
110
100
90
80
1988
1990
1992
1994
1996
1998
2000

REAL EXCHANGE RATE

$$RER = NER \times \frac{P_{us}}{P_{ar}}$$

units :

$$\frac{\text{pesos}}{\text{dollar}} \times \frac{\text{dollars/U.S. basket}}{\text{pesos/Argentine basket}} = \frac{\text{Argentine baskets}}{\text{U.S. basket}}$$

Suppose $P_{ar} = NER \times P_{us}^{T}$ (law of one price)

$$RER^{N} = \frac{P_{ar}^{T}}{P_{us}^{T}} \times \frac{P_{us}}{P_{ar}} = \frac{(P_{us}/P_{us}^{T})}{(P_{ar}/P_{ar}^{T})}$$

RER^{N} is the part of the real exchange rate explained by the relative price of nontraded goods.

What is left over in RER is the real exchange rate for traded goods:

$$RER^T = NER \times \frac{P_{us}^T}{P_{ar}^T}$$

Notice that

$$RER = RER^T \times RER^N$$

$$\log RER = \log RER^T + \log RER^N$$

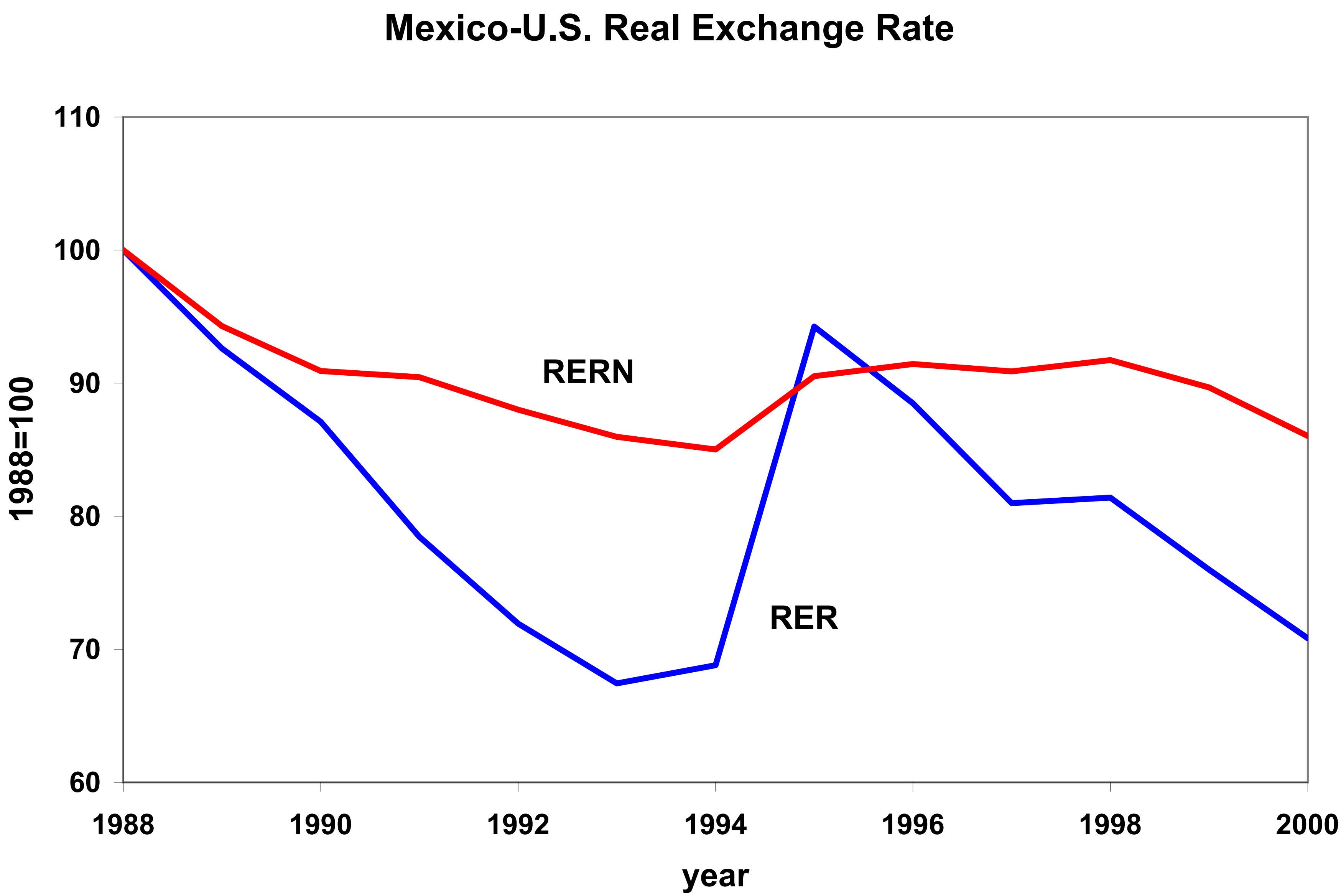
$$rer = rer^T + rer^N$$

TRADED

Agriculture, Mining and Petroleum, and Manufacturing

NONTRADED

Construction and Services



Mexico-U.S. Real Exchange Rate
110
100
90
80
70
60
1988=100
RERN
RER
1988
1990
1992
1994
1996
1998
2000
year

MODEL

Consumers

$$\max \sum_{t=0}^{\infty} \beta^t \Big[\epsilon \Big(\frac{c_{Tt}}{n_t} \Big)^{\rho} + (1-\epsilon) \Big(\frac{c_{Nt}}{n_t} \Big)^{\rho} - 1 \Big] / \rho$$

subject to

$$p_{Tt} c_{Tt} + p_{Nt} c_{Nt} + a_{t+1} = w_t \ell_t + (1 + r_t) a_t + T_t$$

$$a_t \geq -A$$

where

$$a_t = q_{t-1} k_t + b_t,$$

$k_0,\ b_0$ given

Here ℓ_t is working-age population and $n_t = 0.5 \ell_t + 0.5 pop_t$ is adult-equivalent population.

Production functions

Domestically produced traded good

$$y_{Dt} = \min[z_{TD}/a_{TD},\ z_{ND}/a_{ND},\ A_D k_{Dt}^{\alpha_D} \ell_{Dt}^{1-\alpha_D}]$$

Nontraded good

$$y_{Nt} = \min[z_{TN}/a_{TN},\ z_{NN}/a_{NN},\ A_N k_{Nt}^{\alpha_N} \ell_{Nt}^{1-\alpha_N}]$$

Investment good

$$i_t = G z_{TIt}^{\gamma} z_{NIt}^{1-\gamma}$$

Armington aggregator

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

Market clearing

Domestically produced traded good

$$x_{Dt} + x_{Ft} = y_{Dt}$$

Composite traded good

$$c_{Tt} + z_{TIt} + z_{TDt} + z_{TNt} = y_{Tt}$$

Nontraded good

$$c_{Nt} + z_{NIt} + z_{NDt} + z_{NNt} = y_{Nt}$$

Investment good

$$k_{t+1} - (1-\delta)k_t = i_t$$

Factor markets

$$k_{Dt} + k_{Nt} = k_t, \quad \ell_{Dt} + \ell_{Nt} = \ell_t$$

Balance of payments

$$m_t + b_{t+1} = p_{Dt} x_{Ft} + (1 + r_t) b_t$$

Foreign demand

$$x_{Ft} = D((1 + \tau_{Ft}) p_{Dt})^{\frac{-1}{1-\zeta}}$$

Transfer of tariff revenue

$$T_t = \tau_{Dt} m_t$$

Profit maximization

Domestically produced traded good

$$w_t = (p_{Dt} - a_{TDt}p_{Tt} - a_{NDt}p_{Nt})A_D(1-\alpha_D)(k_{Dt}/\ell_{Dt})^{\alpha_D}$$

$$1 + r_t = [(p_{Dt} - a_{TDt}p_{Tt} - a_{NDt}p_{Nt})A_D\alpha_D(\ell_{Dt}/k_{Dt})^{1-\alpha_D} + (1-\delta)q_t]/q_{t-1}$$

Nontraded good

$$w_t = (p_{Nt} - a_{TNt}p_{Tt} - a_{NNt}p_{Nt})A_N(1-\alpha_N)(k_{Nt}/\ell_{Nt})^{\alpha_N}$$

$$1 + r_t = [(p_{Nt} - a_{TNt}p_{Tt} - a_{NNt}p_{Nt})A_N\alpha_N(\ell_{Nt}/k_{Nt})^{1-\alpha_N} + (1-\delta)q_t]/q_{t-1}$$

Investment good

$$p_{Tt} = q_t \gamma G(z_{NIt}/z_{TIt})^{1-\gamma}$$

$$p_{Nt} = q_t (1-\gamma) G(z_{TIt}/z_{NIt})^{\gamma}$$

Armington aggregator

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

$$1 + \tau_{Dt} = p_{Tt}(1-\mu) M^{\zeta} \left(\frac{c_{Tt} + z_{Tt}}{m_t} \right)^{1-\zeta}$$

where

$$p_{Tt} = (1/M)\left[\mu^{\frac{1}{1-\zeta}} p_{Dt}^{\frac{-\zeta}{1-\zeta}} + (1-\mu)^{\frac{1}{1-\zeta}} (1+\tau_{Dt})^{\frac{-\zeta}{1-\zeta}}\right]^{\frac{-(1-\zeta)}{\zeta}}$$

CAPITAL ADJUSTMENT FRICTIONS

$$i_{Dt+1} + i_{Nt+1} \le G z_{Tt}^{\gamma} z_{Nt}^{1-\gamma}$$

$$k_{Dt+1} \le \phi(i_{Dt+1}/k_{Dt})k_{Dt} + (1-\delta)k_{Dt}$$

$$k_{Nt+1} \le \phi(i_{Nt+1}/k_{Nt})k_{Nt} + (1-\delta)k_{Nt}$$

$$\phi'(i/k) > 0, \;\; \phi''(i/k) < 0, \;\; \phi(\delta) = \delta, \quad \phi'(\delta) = 1$$

$$(\phi(i/k) = (\delta^{1-\eta}(i/k)^{\eta} - (1-\eta)\delta)/\eta, \quad 0 < \eta \le 1)$$

Adjusting the sector specific capital stock rapidly is costly. Capital in the traded goods sector has a different price, q_{Dt}, than capital in the nontraded goods sector, q_{Nt}.

(In simulations $\eta = 0.9$.)

LABOR ADJUSTMENT FRICTIONS

$$\ell_{Dt+1} \leq \lambda \ell_{Dt}$$

$$\ell_{Nt+1} \leq \lambda \ell_{Nt}$$

There is a limit to how fast sector specific labor can adjust. Labor in the traded goods sector receives a different wage, w_{Dt}, than labor in the nontraded goods sector, w_{Nt}.

(In simulations $\lambda = 1.03$.)

SUDDEN STOP!

$$b_t = b_{t-1} + \overline{b},\ t = T, \ldots, T + N$$

Domestic interest rate is endogenously determined, although interest payments on foreign debt $-b_t$ are made at international interest rate.

REAL GDP

$$Y_t = p_{Dt_0} y_{Dt} - p_{Tt_0} z_{TDt} - p_{Nt_0} z_{NDt} \\ + p_{Nt_0} y_{Nt} - p_{Tt_0} z_{TNt} - p_{Nt_0} z_{NNt} + \tau_{Dt} m_t$$

REAL INVESTMENT

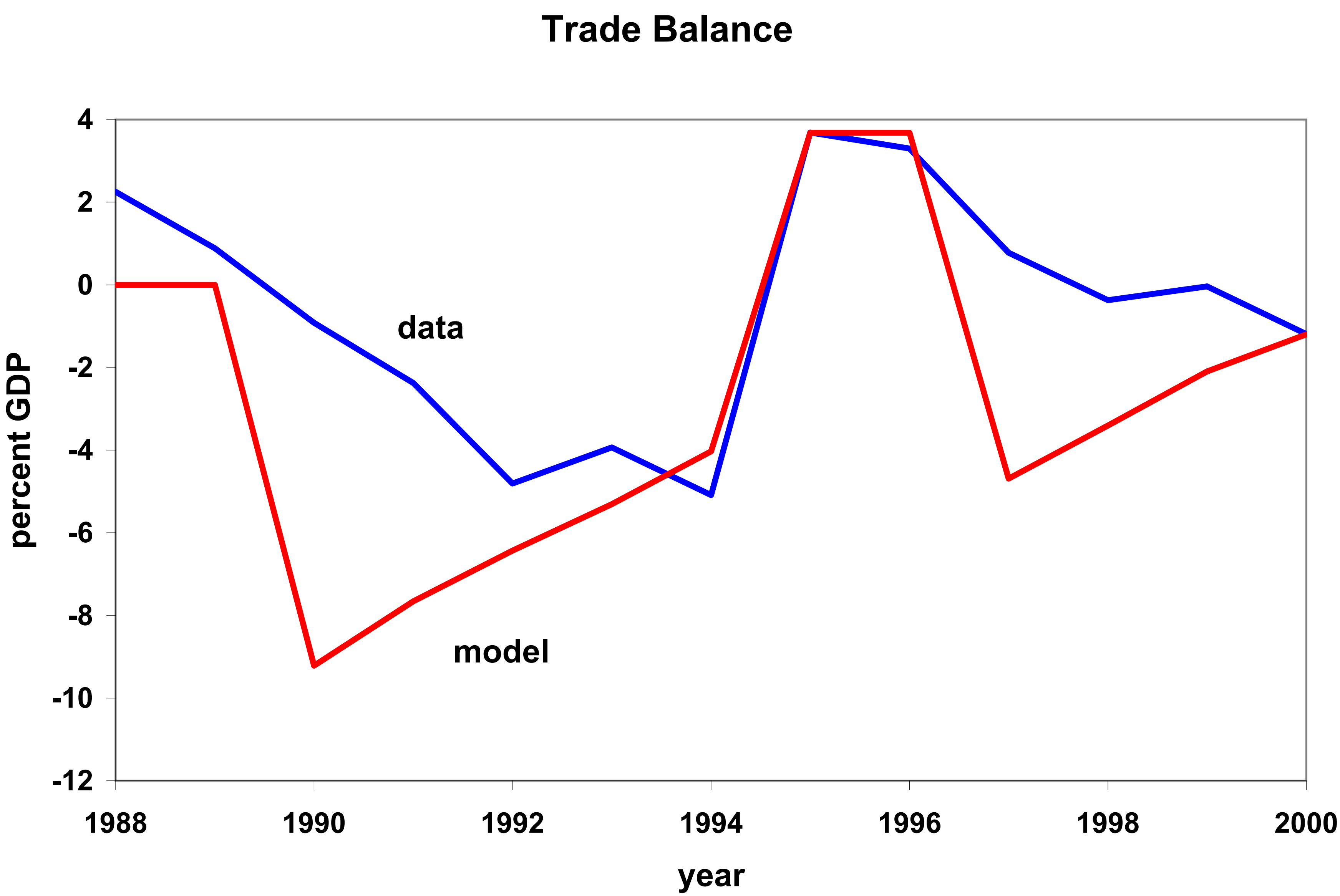
$$I_t = p_{Tt_0} z_{TIt} + p_{Nt_0} z_{NIt}$$

REAL CAPITAL STOCK

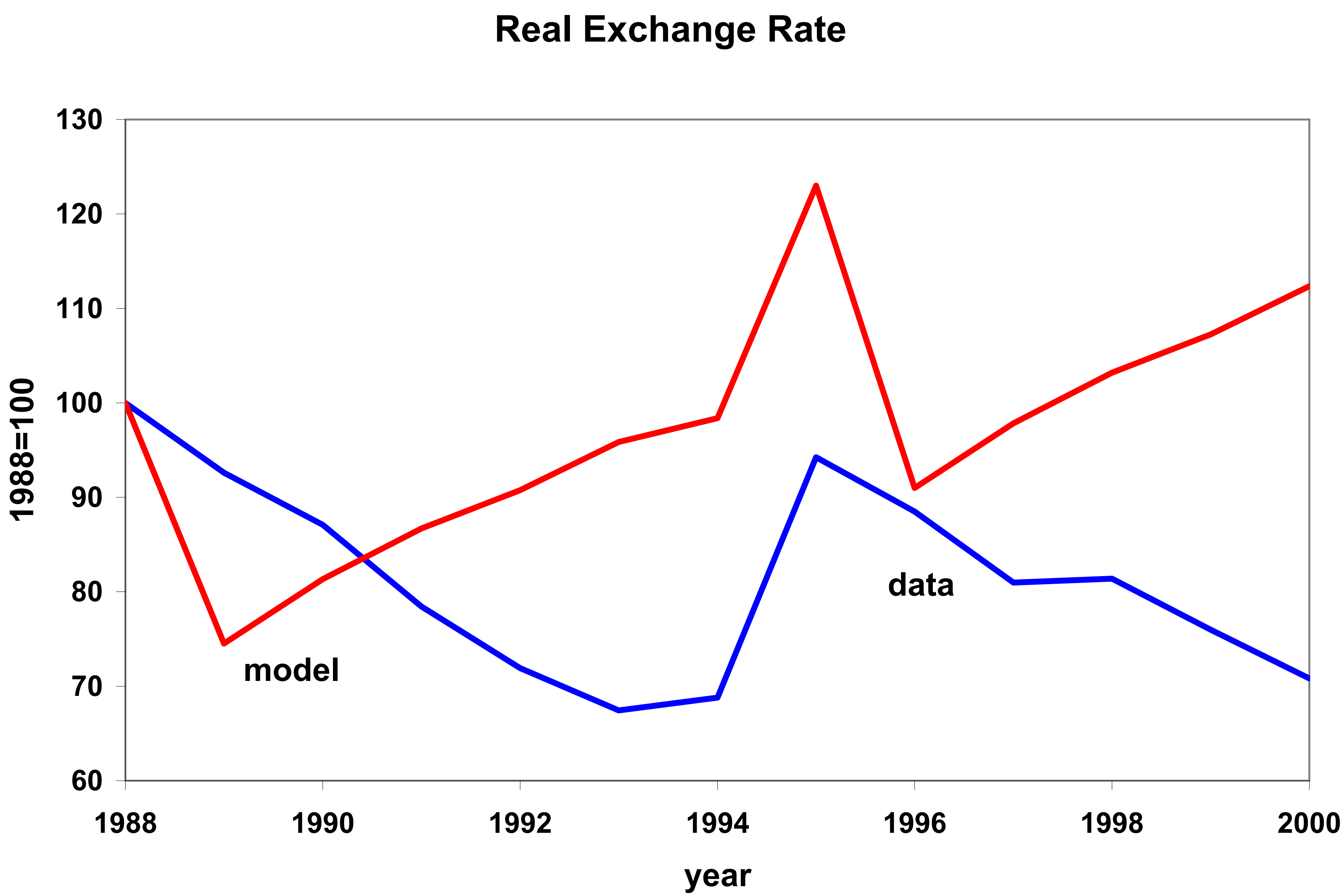
$$K_{t+1} = (1-\delta) K_t + I_t$$

TOTAL FACTOR PRODUCTIVITY

$$TFP_t = \frac{Y_t}{K_t^{\alpha} (\ell_{Dt} + \ell_{Nt})^{1-\alpha}}$$


Trade Balance
percent GDP
4
2
0
-2
-4
-6
-8
-10
-12
data
model
1988
1990
1992
1994
1996
1998
2000
year


Real GDP per Working Age (15-64) person and TFP in Mexico Model
115
110
105
100
95
90
1988=100
GDP
TFP
1988
1990
1992
1994
1996
1998
2000
year


Real Exchange Rate
130
120
110
100
90
80
70
60
1988=100
model
data
1988
1990
1992
1994
1996
1998
2000
year