

Decades Lost and Found: Mexico and Chile Since 1980

Raphael Bergoeing
Patrick J. Kehoe
Timothy J. Kehoe
Raimundo Soto

June 2003

Universitat Pompeu Fabra

www.econ.umn.edu/~tkehoe

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

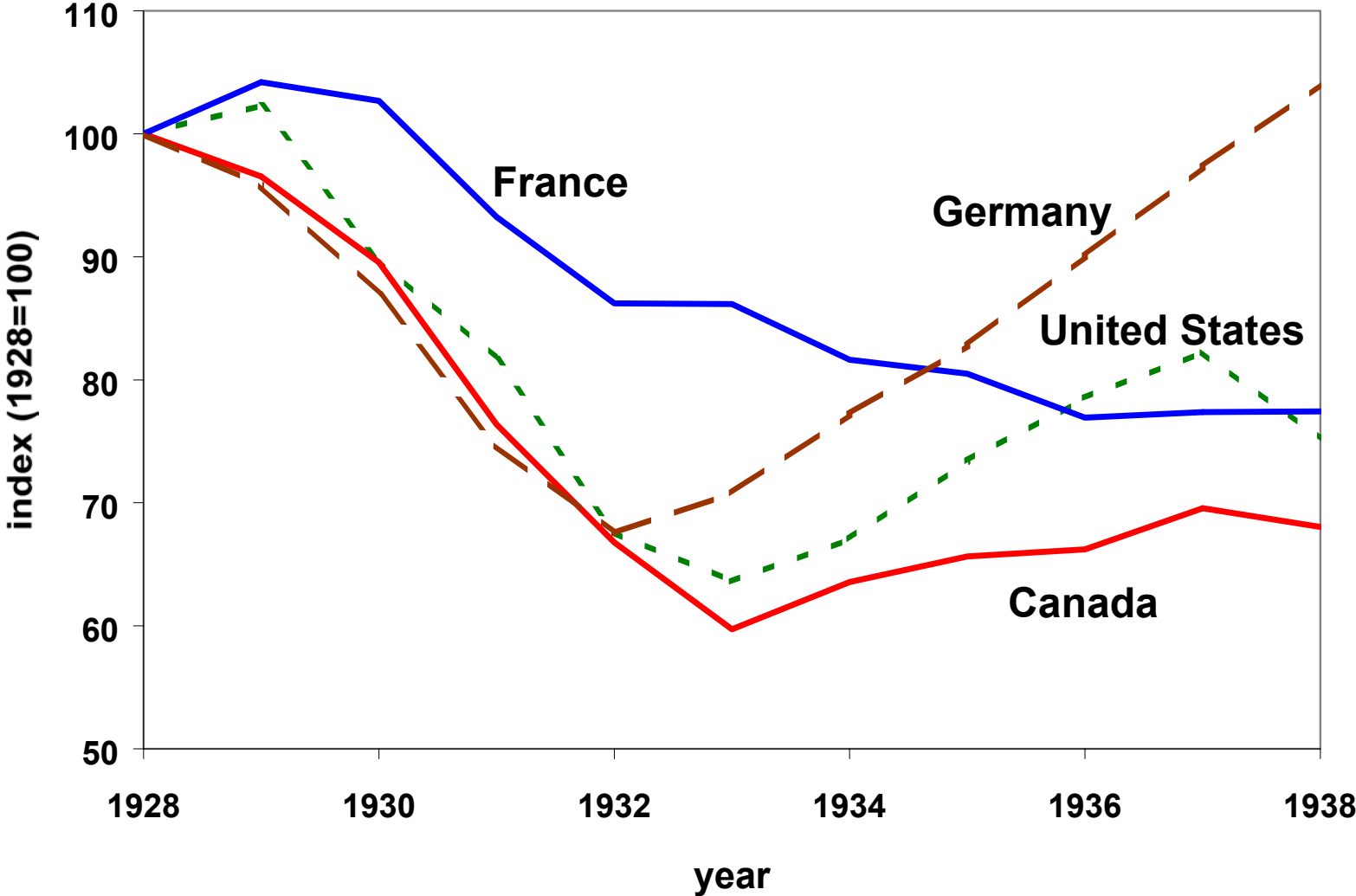
Argentina (1970s and 1980s) — Kydland and Zarazaga

Chile and Mexico (1980s) — Bergoeing, Kehoe, Kehoe, and Soto

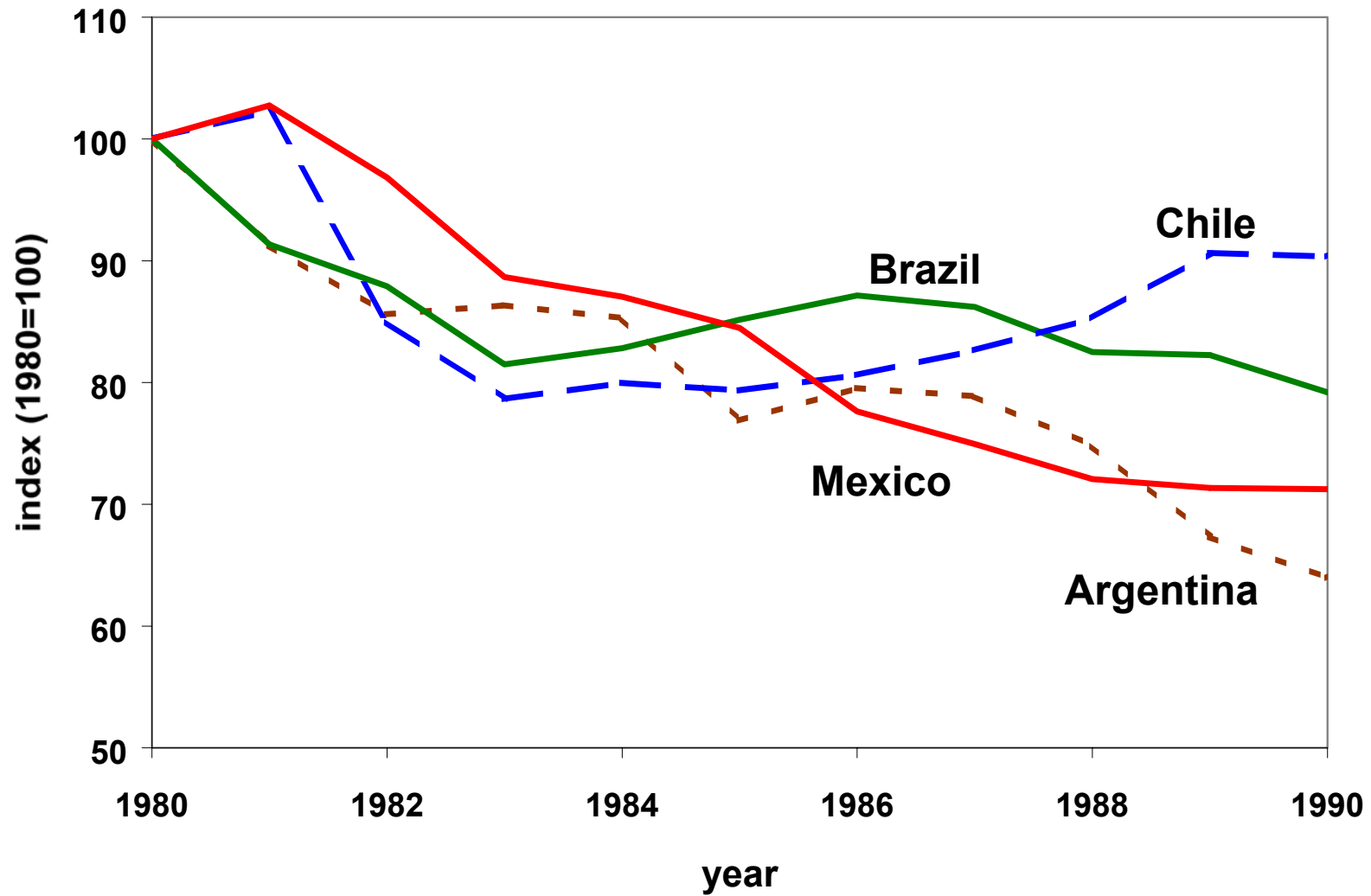
Japan (1990s) — Hayashi and Prescott

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

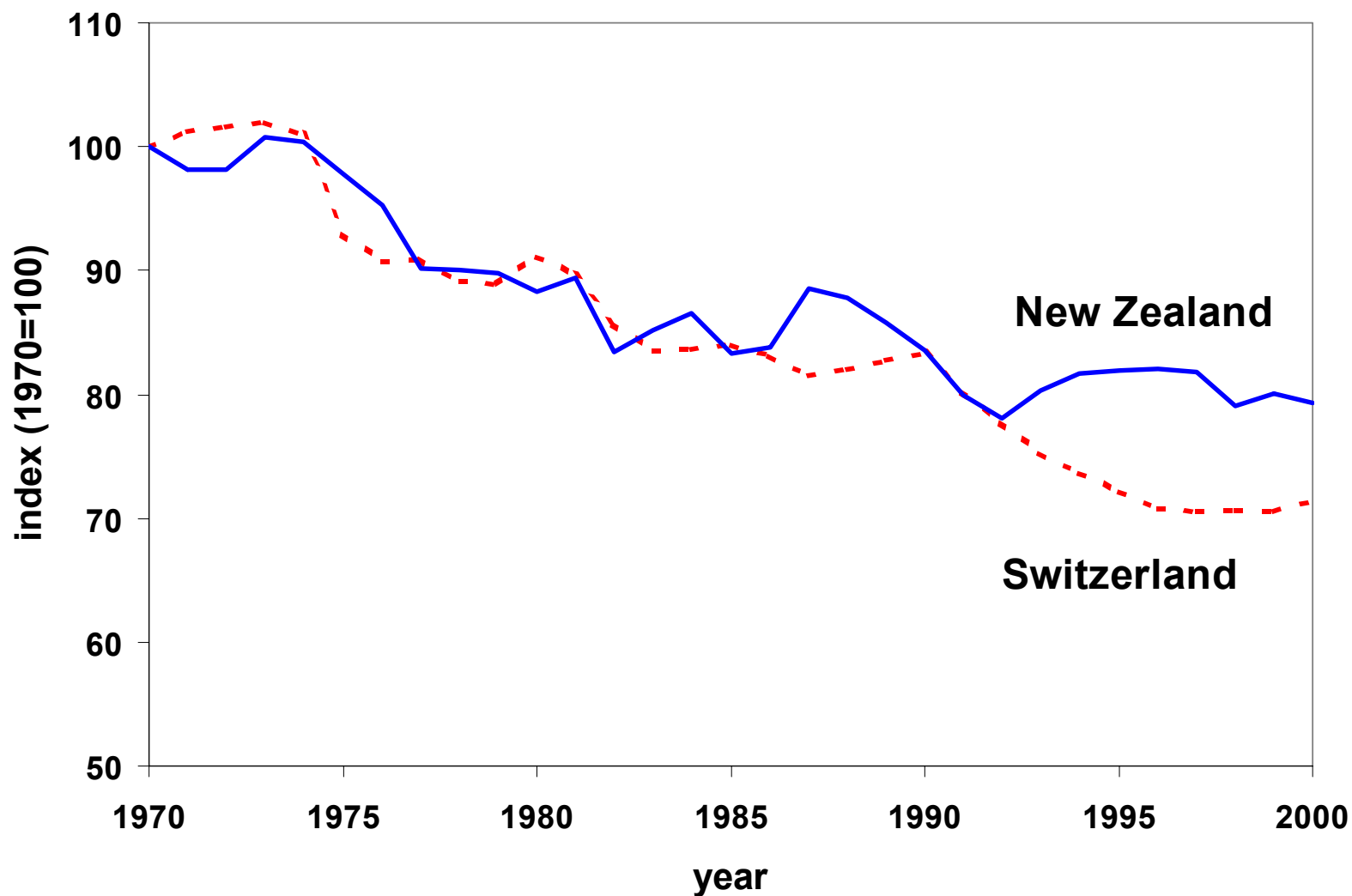
Detrended output per person during the Great Depression.



Detrended output per working-age person during the 1980s in Latin America.



Detrended output per working-age person in New Zealand and Switzerland 1970-2000.



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.

Mexico and Chile in the 1980s

Similar crises in 1981-1983

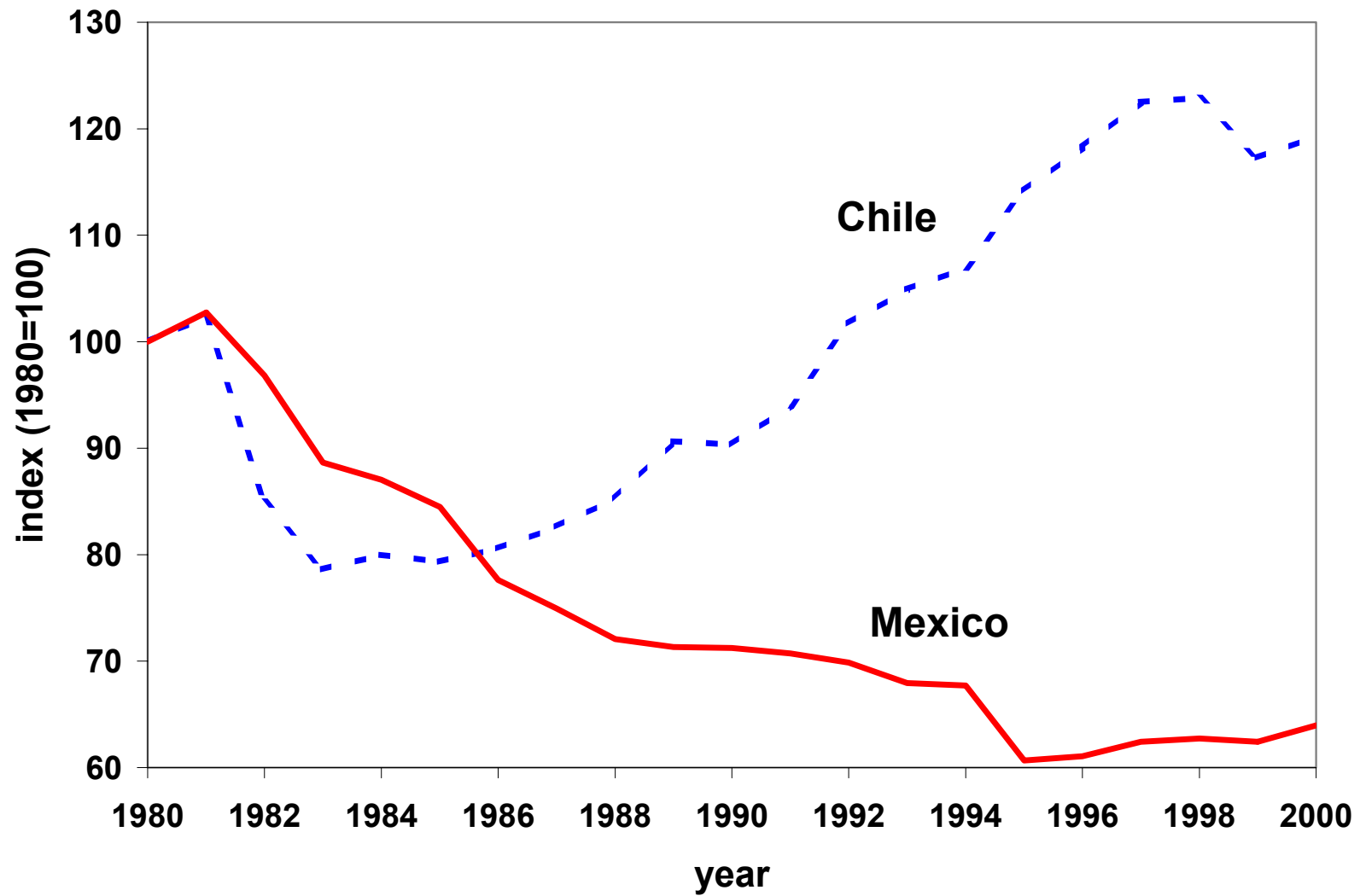
- more severe in Chile than in Mexico

Different recoveries

- much faster in Chile than in Mexico

Why different pattern?

Real GDP per working-age (15-64) person detrended by 2 percent per year



Similar crises

Initial conditions:

- large foreign debt
- appreciating real exchange rate
- large trade deficit
- banking problems.

Shocks:

- jump in world interest rate
- plummet in copper and oil prices
- cutoff in foreign lending.

Stories for different recoveries

Standard monetarist story

- Different money growth rates induced different real responses.

Corbo-Fischer's story for Chile's fast recovery

- Sharp depreciation of real exchange rate and decline in real wages generated export-led growth.

Sachs's story for Mexico's slow recovery

- Debt overhang deterred investment.

Structural reforms story

- Structural reforms that took place in Chile in the 1970s took place in Mexico in the 1980s or 1990s.

Monetarist story

expansionary monetary policy

⇒ rapid growth

Short of inducing hyperinflation, the more rapidly a country in a depression reflate, the better.

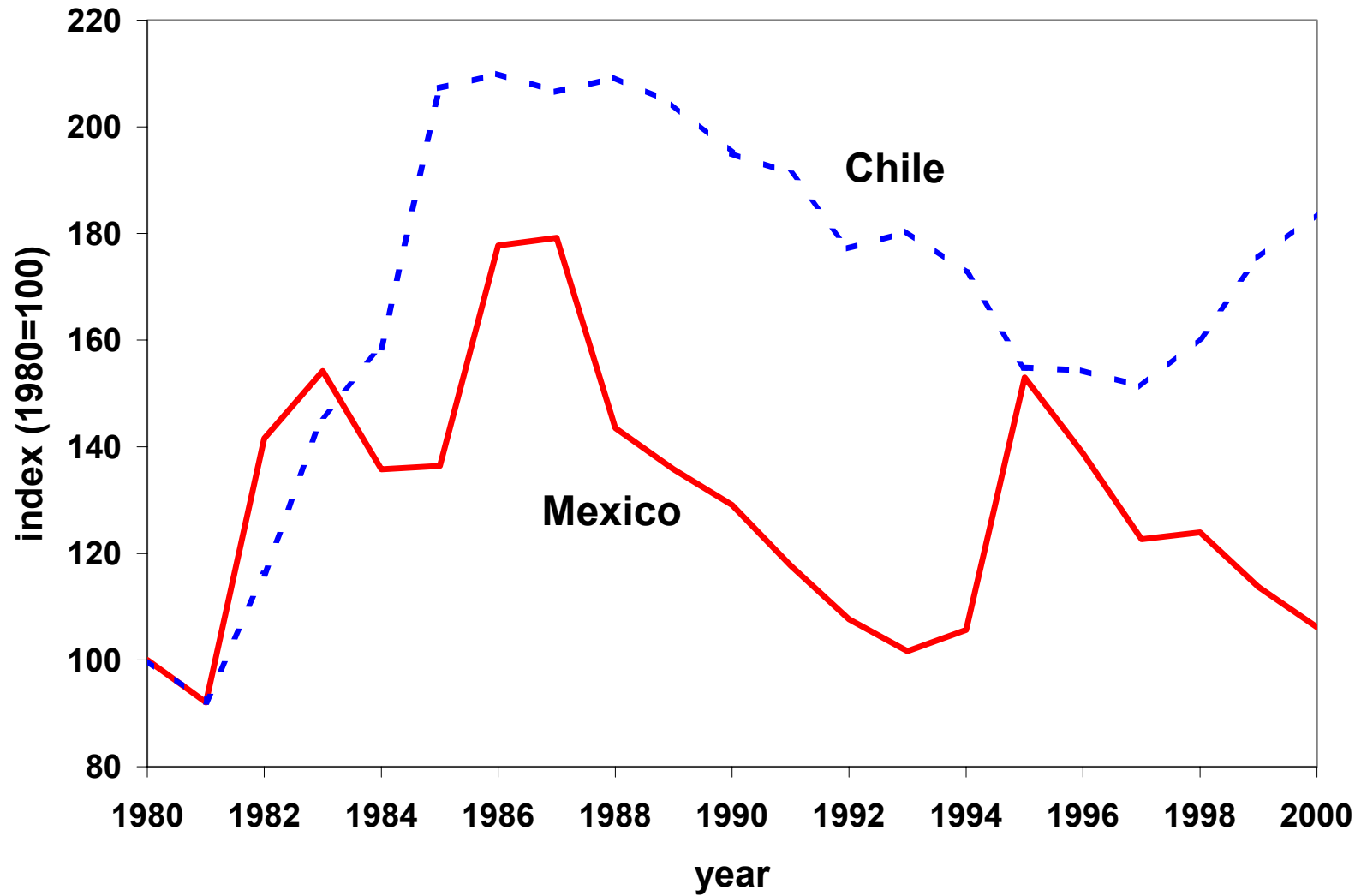
What happened in Mexico and Chile?

Corbo-Fischer's story for Chile

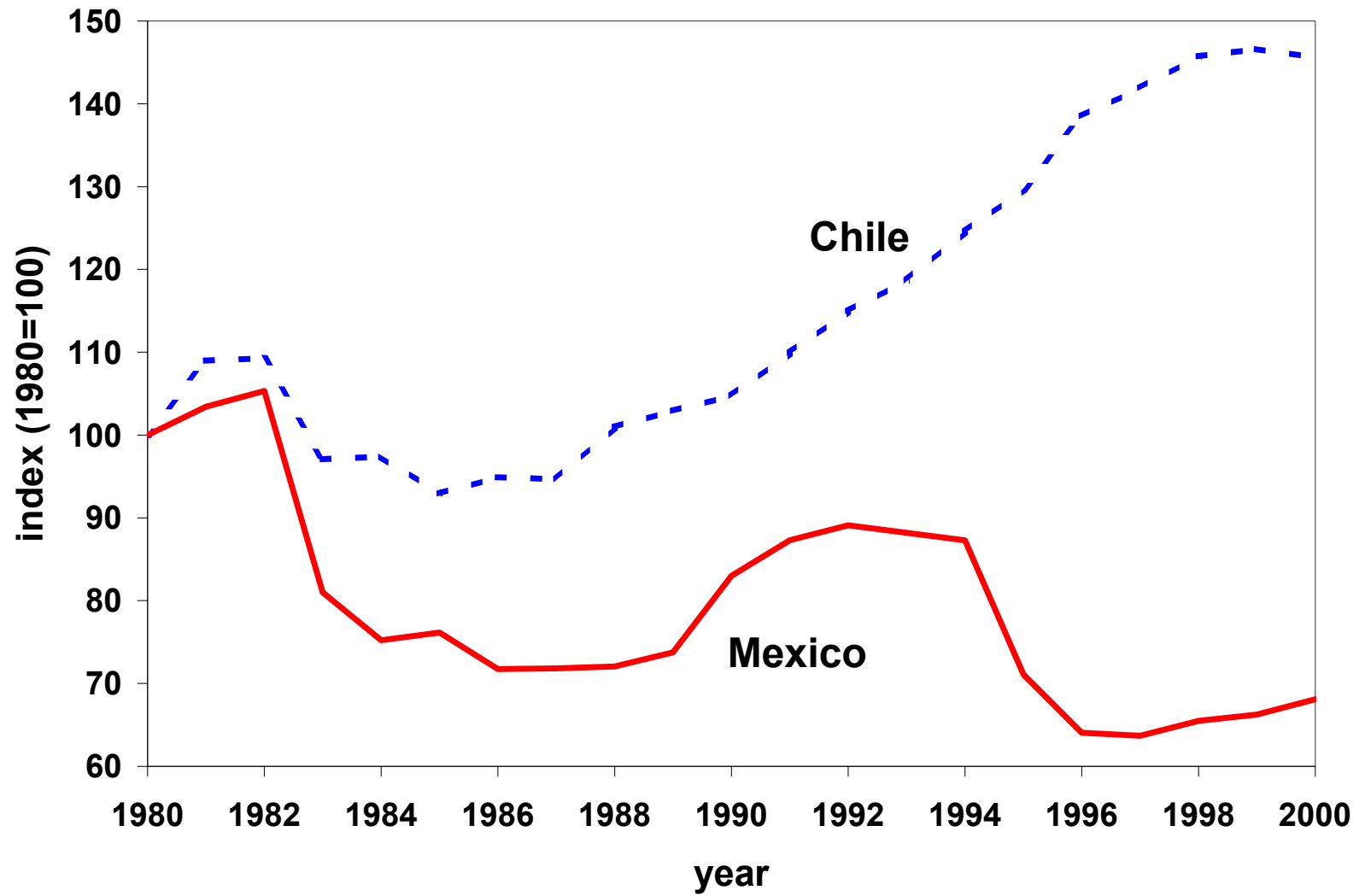
Sustained real depreciation of the real exchange rate and decline in real wages generated export-led growth in Chile.

What about Mexico?

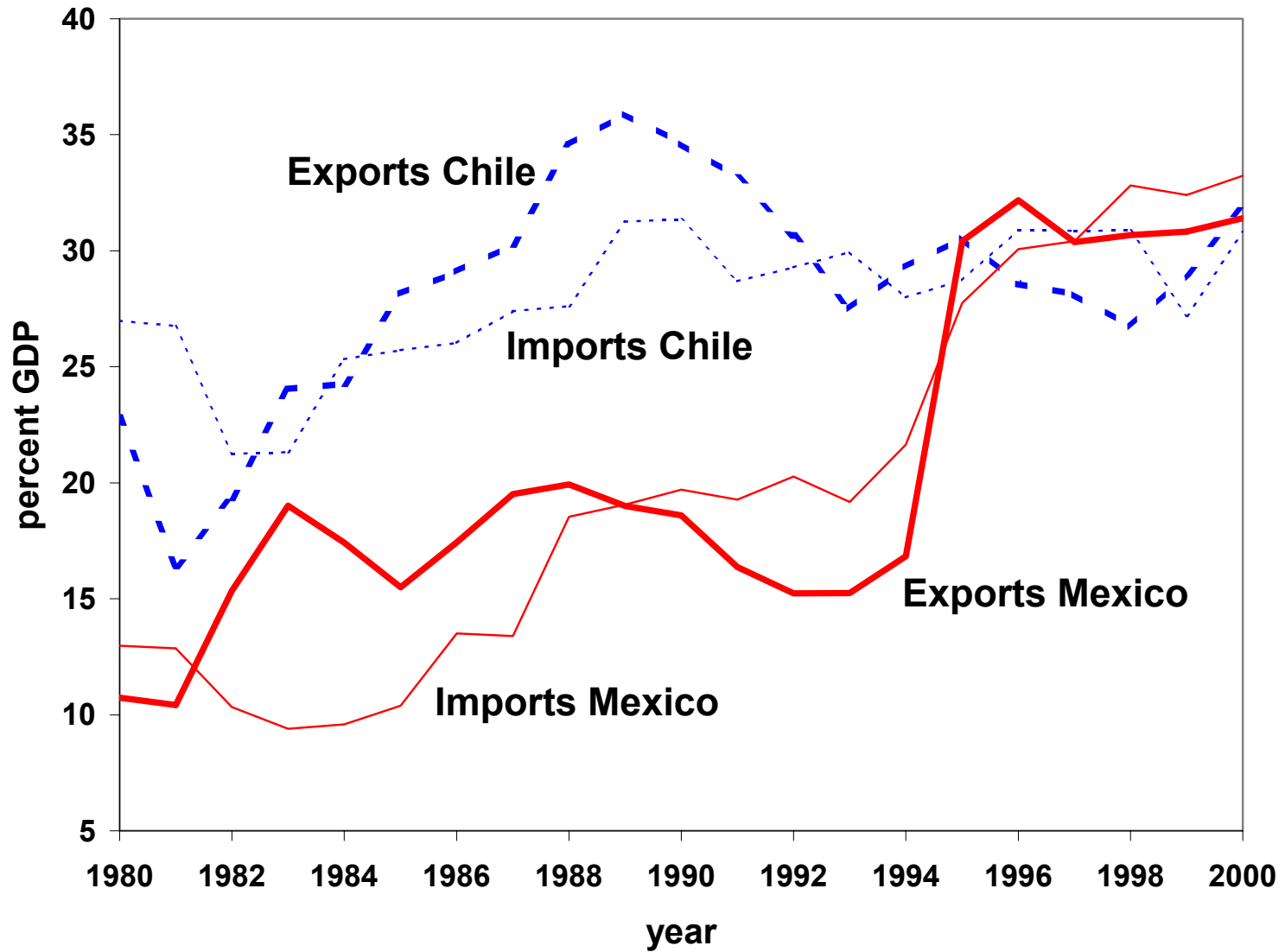
Real exchange rate against U.S. dollar



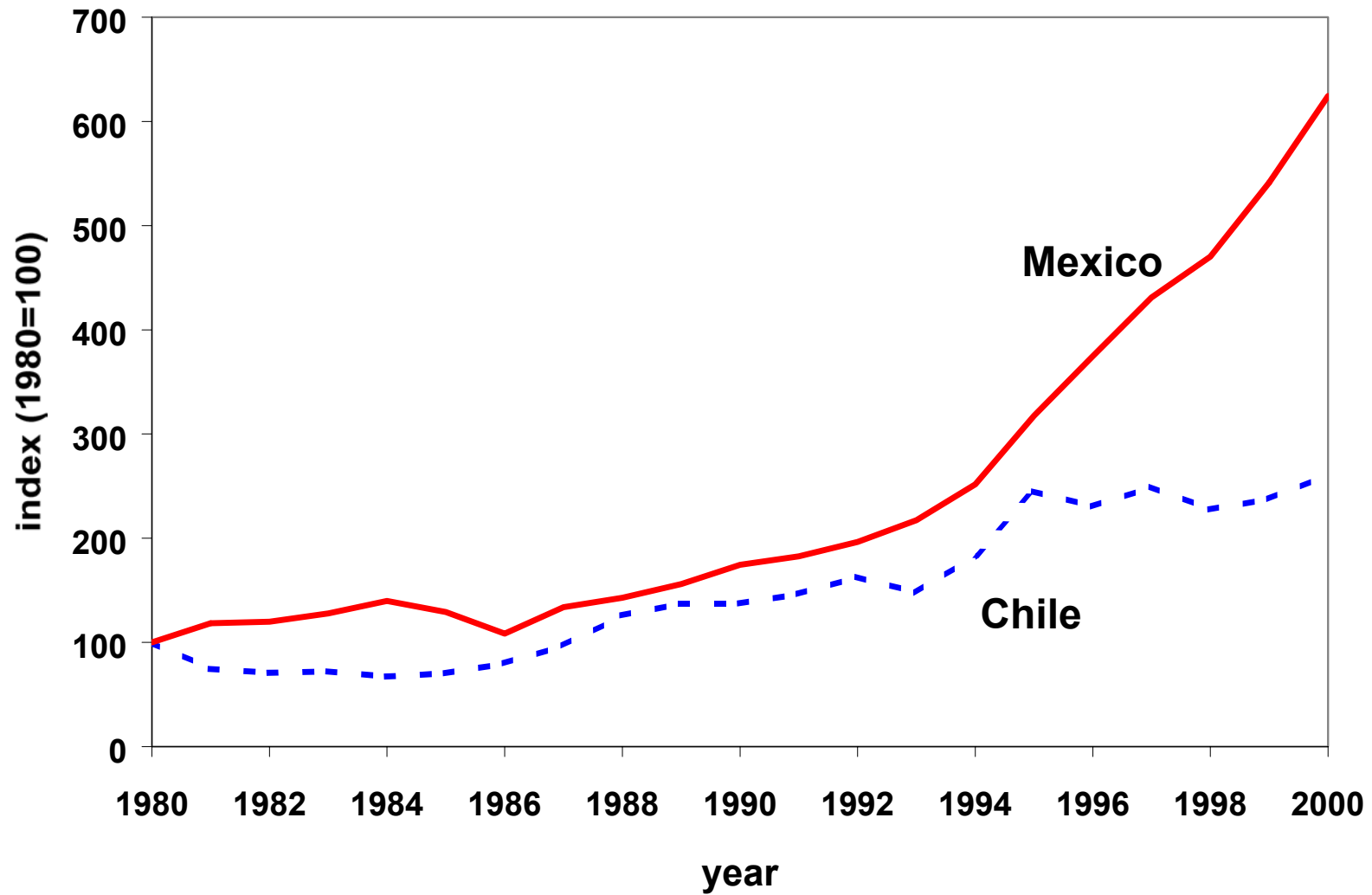
Index of real wages in manufacturing



International trade as a percent of GDP



Export value in U.S. dollars deflated by U.S. PPI



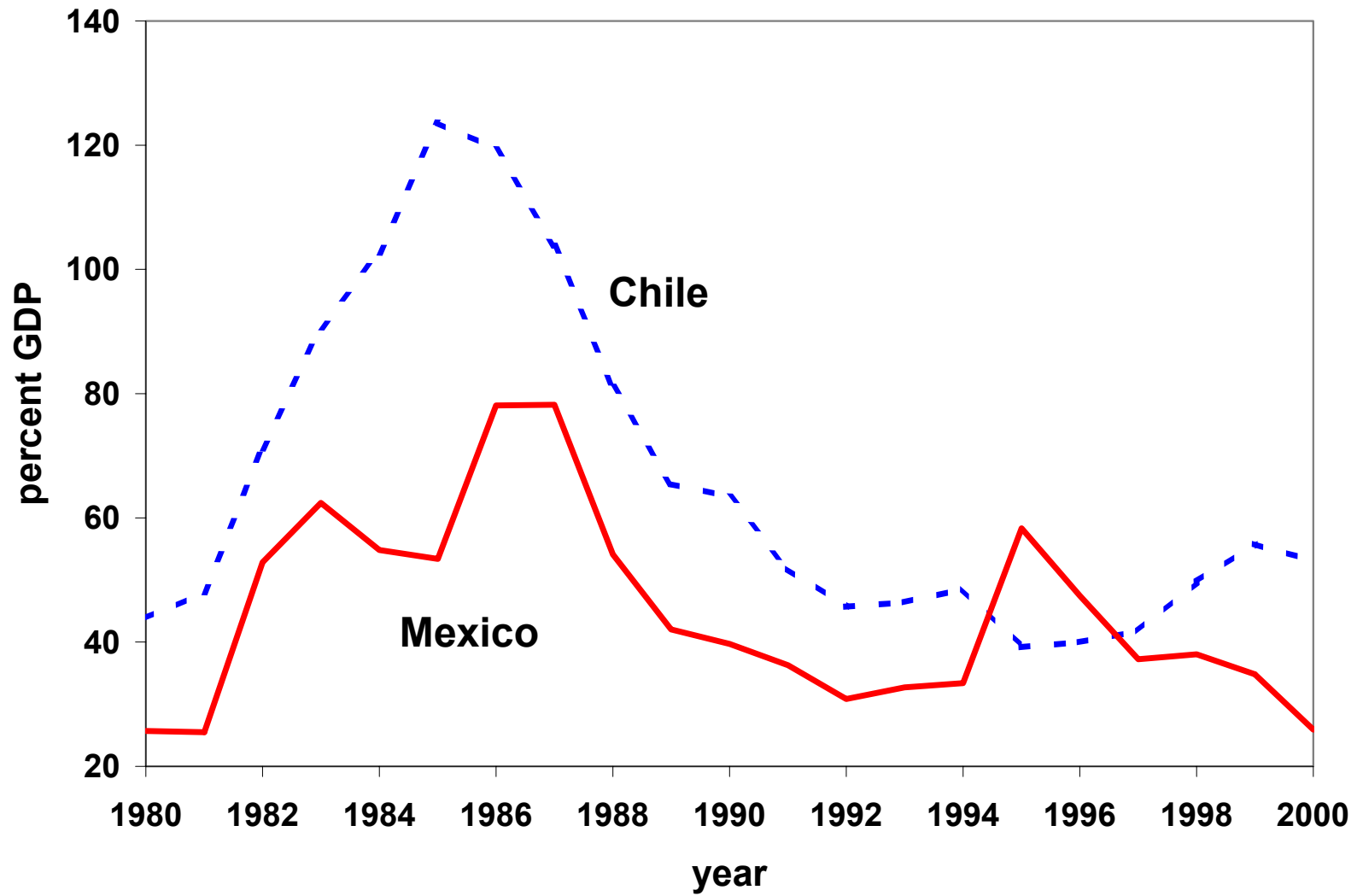
Sachs's story for Mexico

Large debt overhang in Mexico:

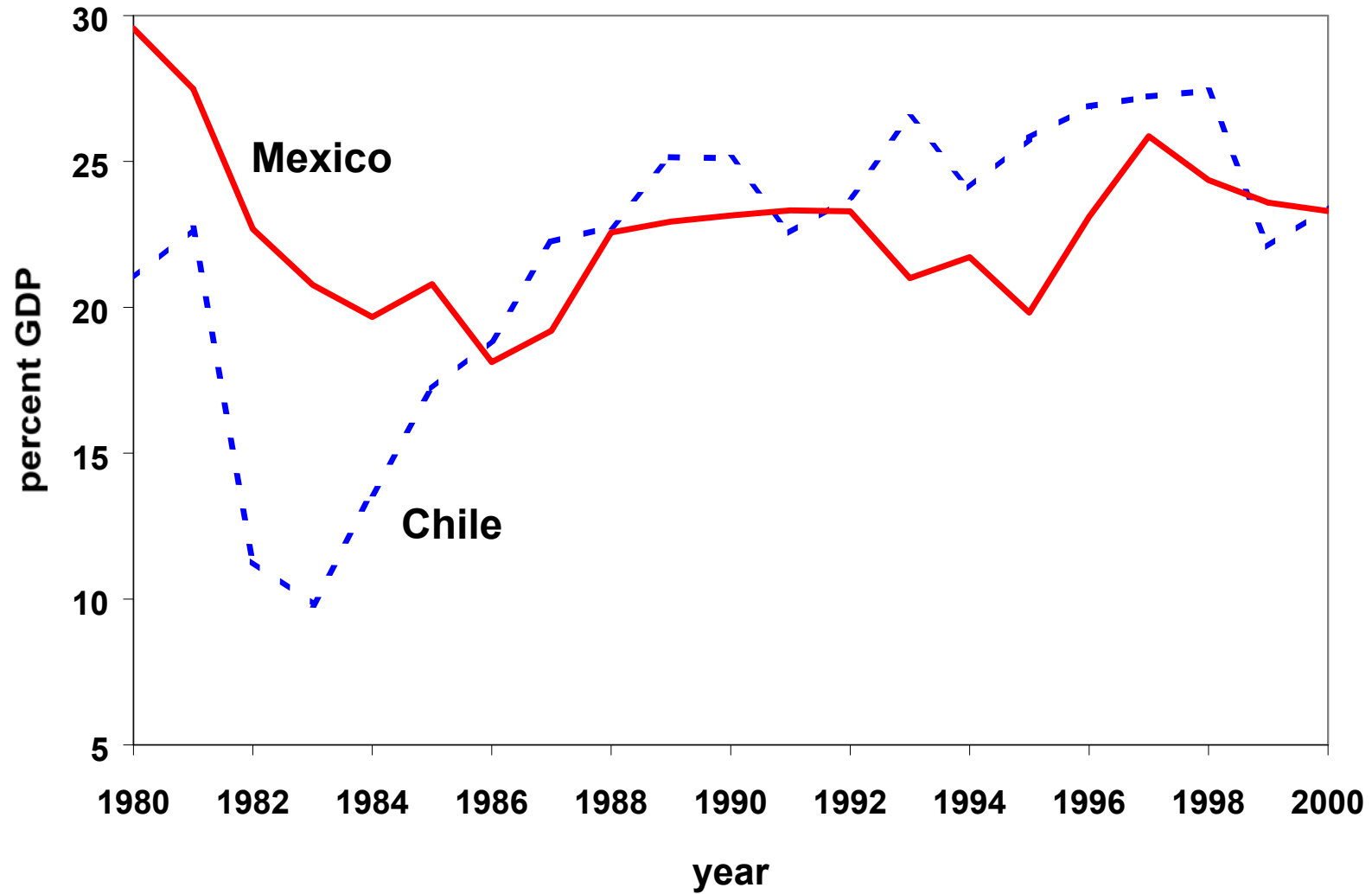
- Most of new loans needed to repay old loans.
- Socially profitable investments not undertaken.

What about Chile?

Total external debt as a percent of GDP



Investment as a percent of GDP



Structural reforms story

By 1979 Chile had privatized and reformed its tax system, its banking system, its bankruptcy laws, and its trade policies.

Mexico waited until later.

Different recoveries:

- Chile reaping benefits of reforms.
- Mexico paying costs for distortions.

How can we determine which reforms were crucial?

- Did reforms affect factor inputs or productivity?
- What was timing of reforms?

Growth accounting

Production function:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha}$$

Capital accumulation:

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

$$\alpha = 0.30, \delta = 0.05.$$

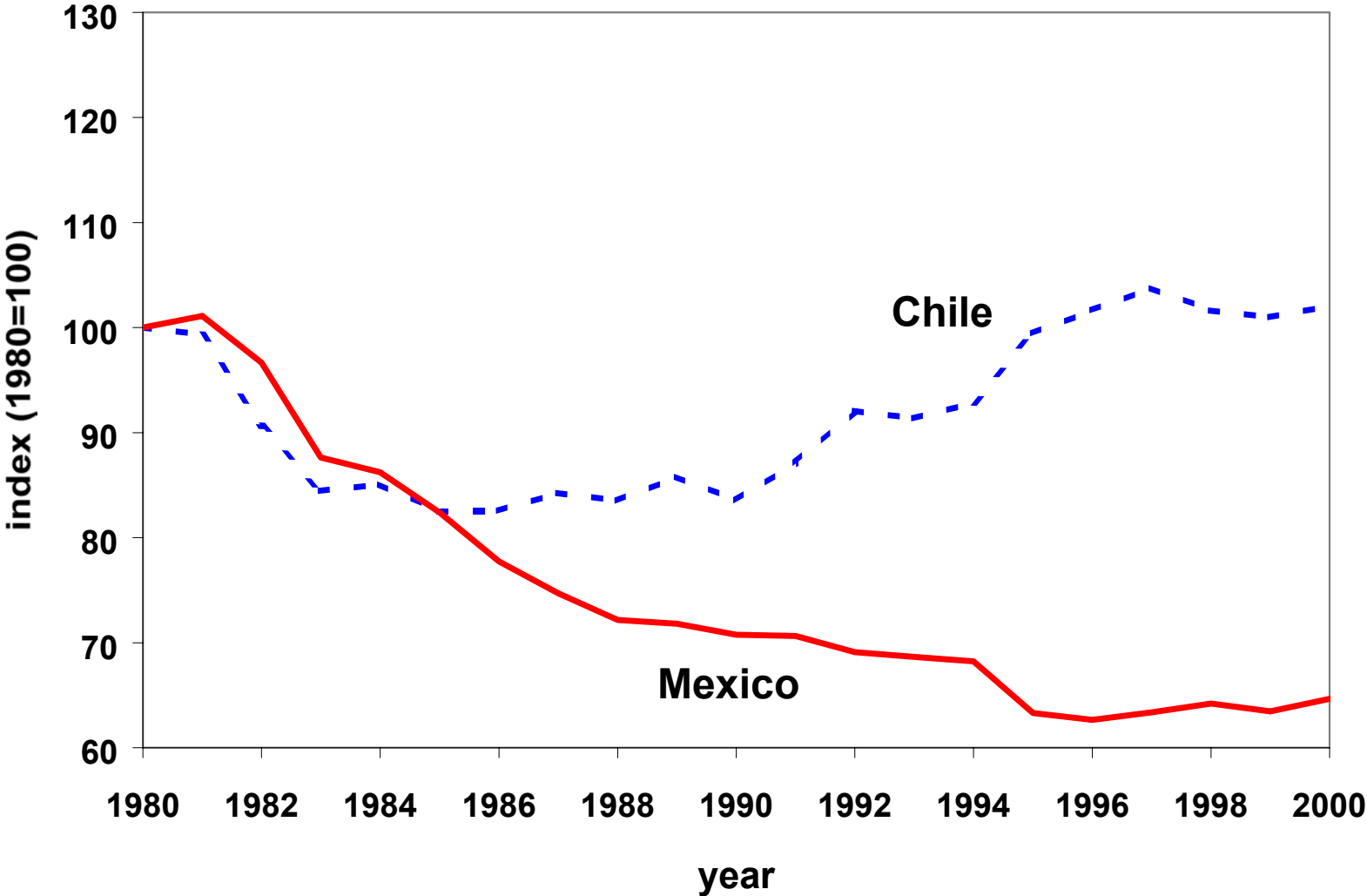
Decomposition of changes in output

$$\log\left(\frac{Y_t}{N_t}\right) = \log A_t + \alpha \log\left(\frac{K_t}{N_t}\right) + (1 - \alpha) \log\left(\frac{L_t}{N_t}\right)$$

$$\log\left(\frac{Y_t}{N_t}\right) = \frac{1}{1 - \alpha} \log A_t + \frac{\alpha}{1 - \alpha} \log\left(\frac{K_t}{Y_t}\right) + \log\left(\frac{L_t}{N_t}\right)$$

$$\begin{aligned} \left[\log\left(\frac{Y_{t+s}}{N_{t+s}}\right) - \log\left(\frac{Y_t}{N_t}\right) \right] / s &= \frac{1}{1 - \alpha} [\log A_{t+s} - \log A_t] / s \\ &+ \frac{\alpha}{1 - \alpha} \left[\log\left(\frac{K_{t+s}}{Y_{t+s}}\right) - \log\left(\frac{K_t}{Y_t}\right) \right] / s \\ &+ \left[\log\left(\frac{L_{t+s}}{N_{t+s}}\right) - \log\left(\frac{L_t}{N_t}\right) \right] / s. \end{aligned}$$

Total factor productivity detrended by 1.4 percent per year



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

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

where $T_t = \tau_t(r_t - \delta)K_t$ is a lump-sum transfer.

Feasibility:

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

Calibration

First order conditions:

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

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

Look at 1960-1980 data

$$\beta = 0.98, \quad \tau = 1 - \frac{C_t - \beta C_{t-1}}{(r_t - \delta)C_{t-1}} \Rightarrow \tau = 0.45 \text{ in Mexico, } \tau = 0.56 \text{ in Chile;}$$

$$\gamma = \frac{C_t}{C_t + w_t(\bar{h}N_t - L_t)} \Rightarrow \gamma = 0.30 \text{ in Mexico, } \gamma = 0.28 \text{ in Chile .}$$

Numerical experiments

Base case:

$\tau_t = 0.45$ in Mexico, $\tau_t = 0.56$ in Chile, 1980-2000.

Tax reform:

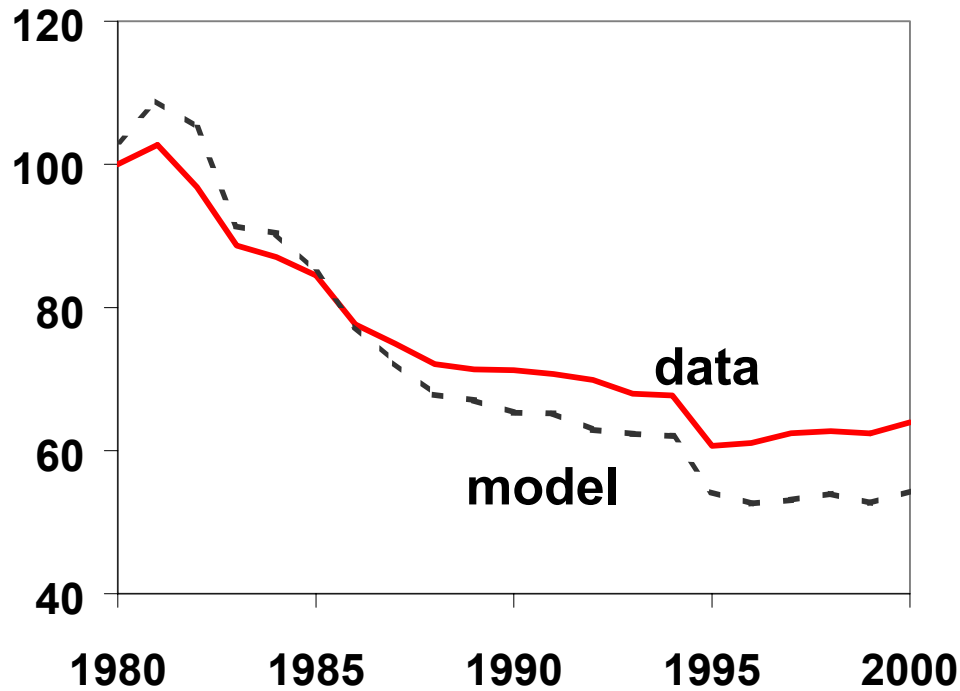
$\tau_t = 0.45$ in Mexico, $\tau_t = 0.56$ in Chile, 1980-1988;

$\tau_t = 0.12$ in Mexico, $\tau_t = 0.12$ in Chile, 1988-2000.

Numerical experiments for Mexico: GDP per working-age person

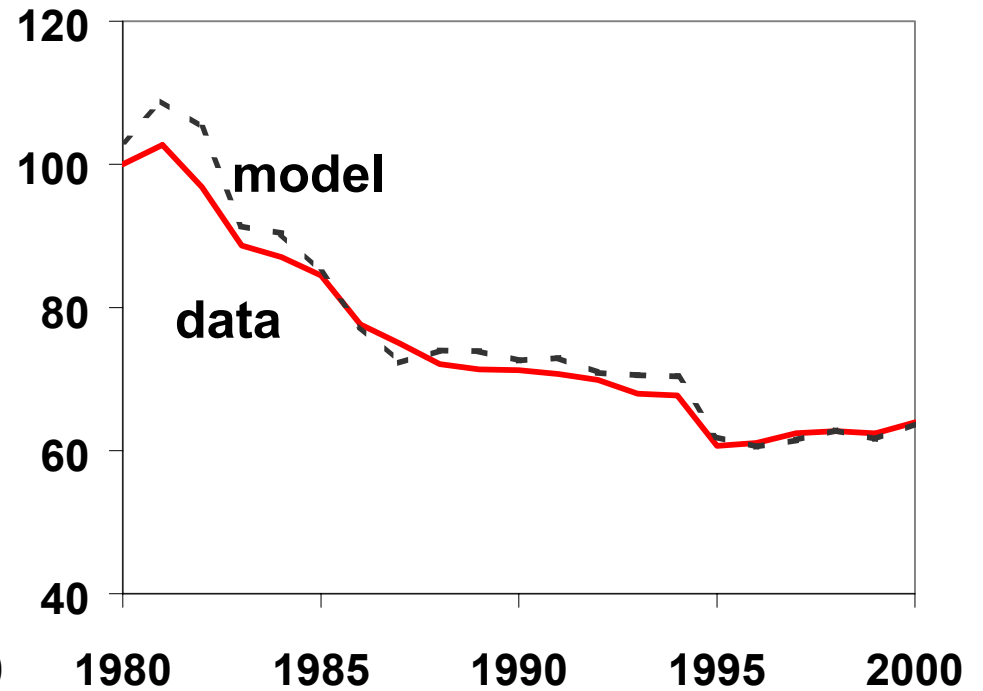
Base Case

Y/N (detrended)



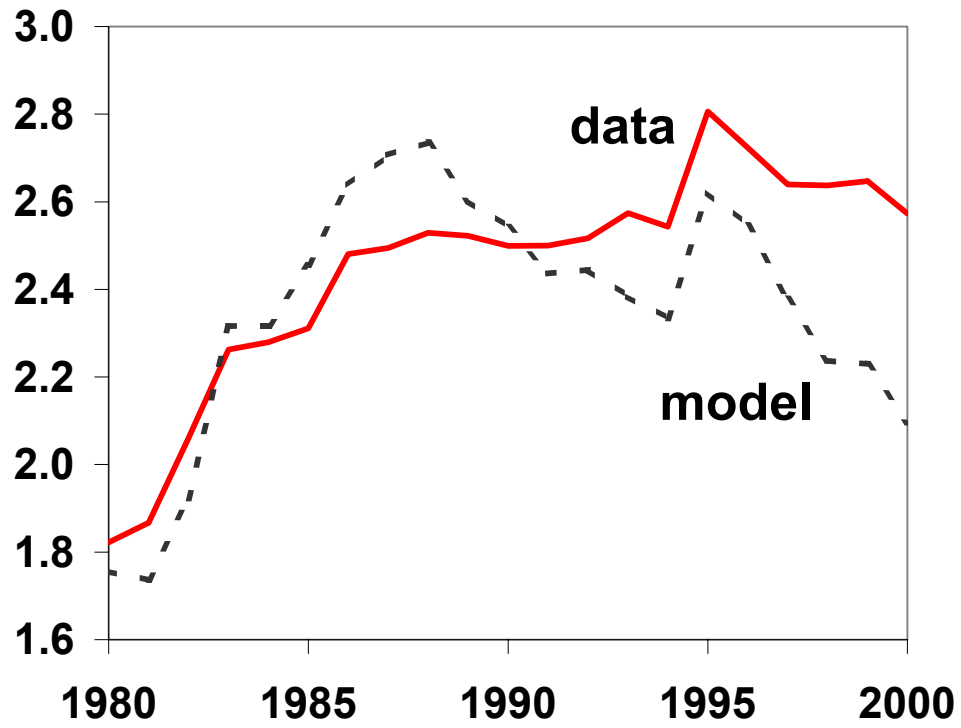
Tax Reform

Y/N (detrended)



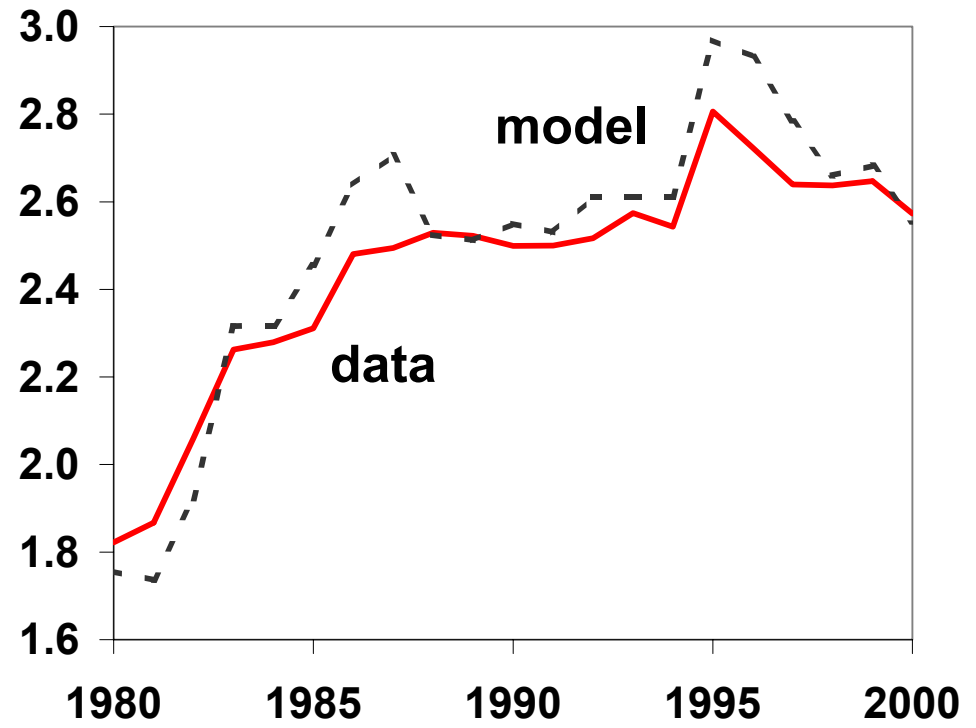
Base Case

K/Y



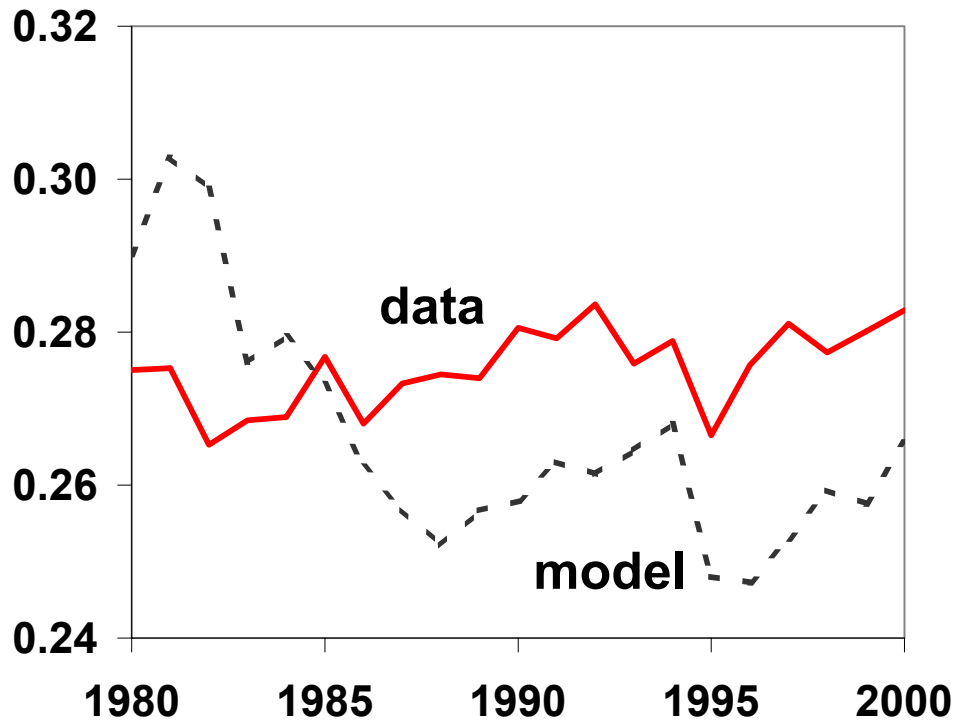
Tax Reform

K/Y



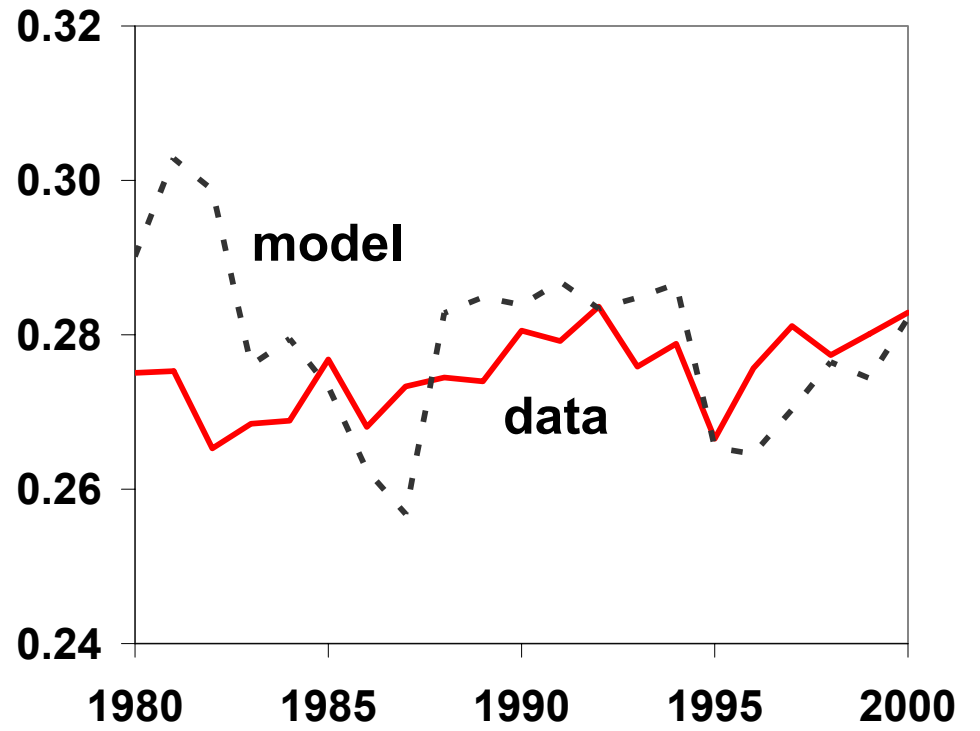
Base Case

L/N



Tax Reform

L/N



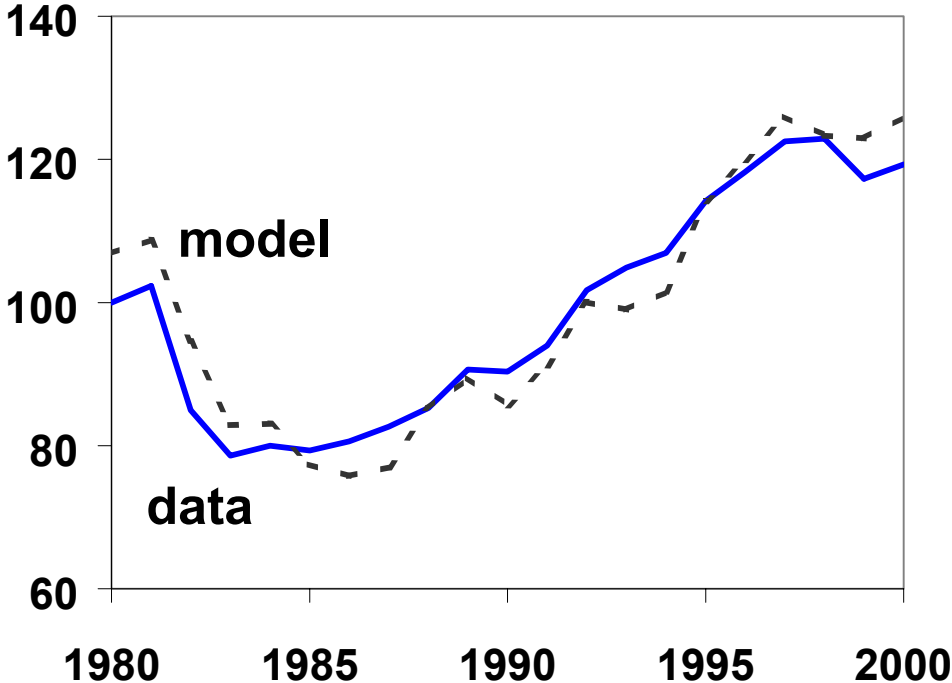
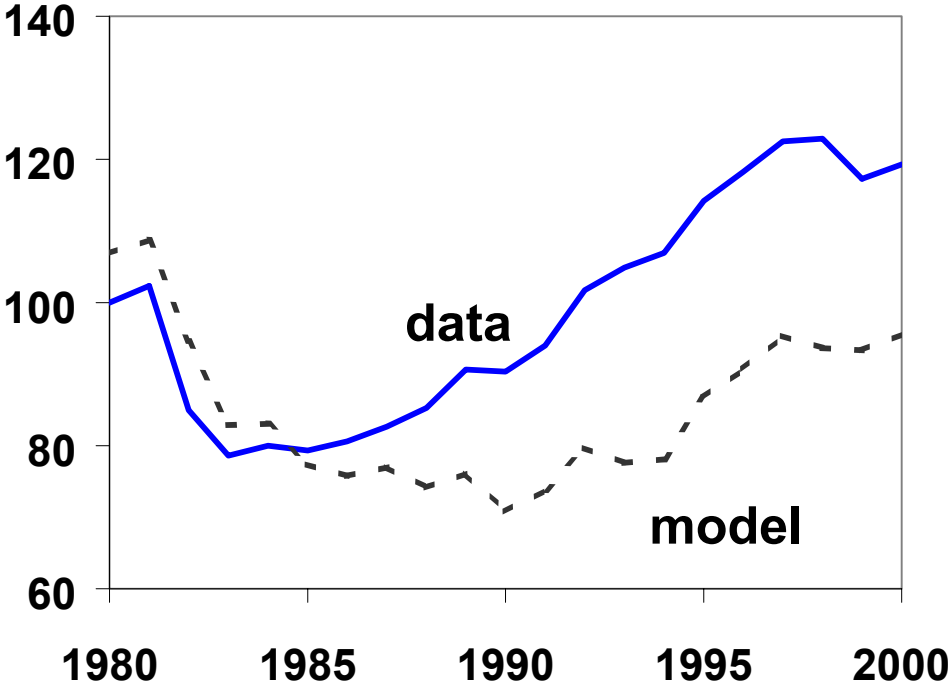
Numerical experiments for Chile: GDP per working-age person

Base Case

Tax Reform

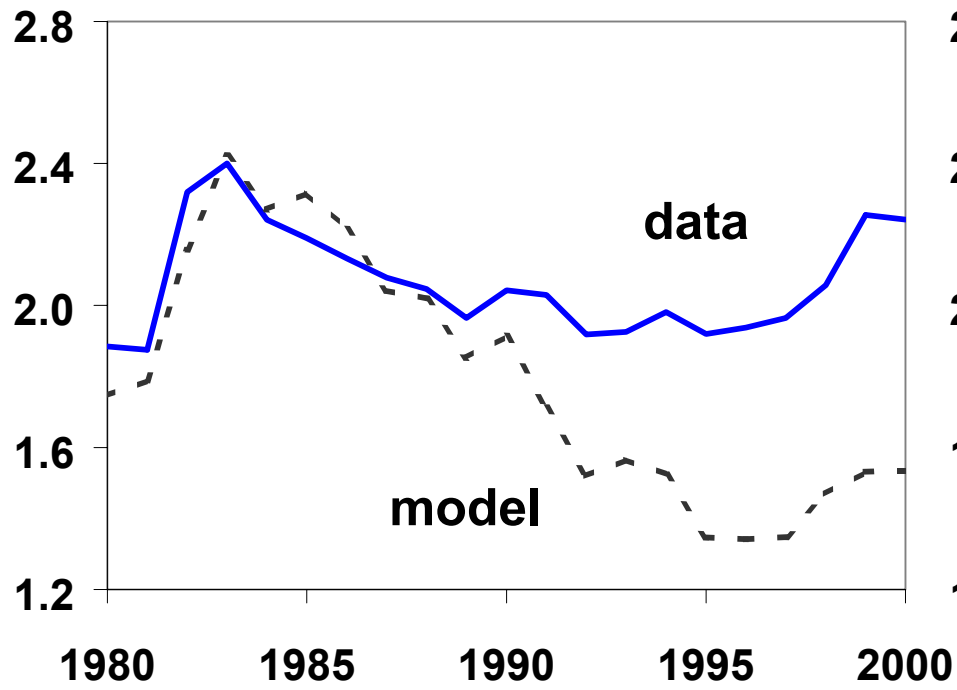
Y/N (detrended)

Y/N (detrended)



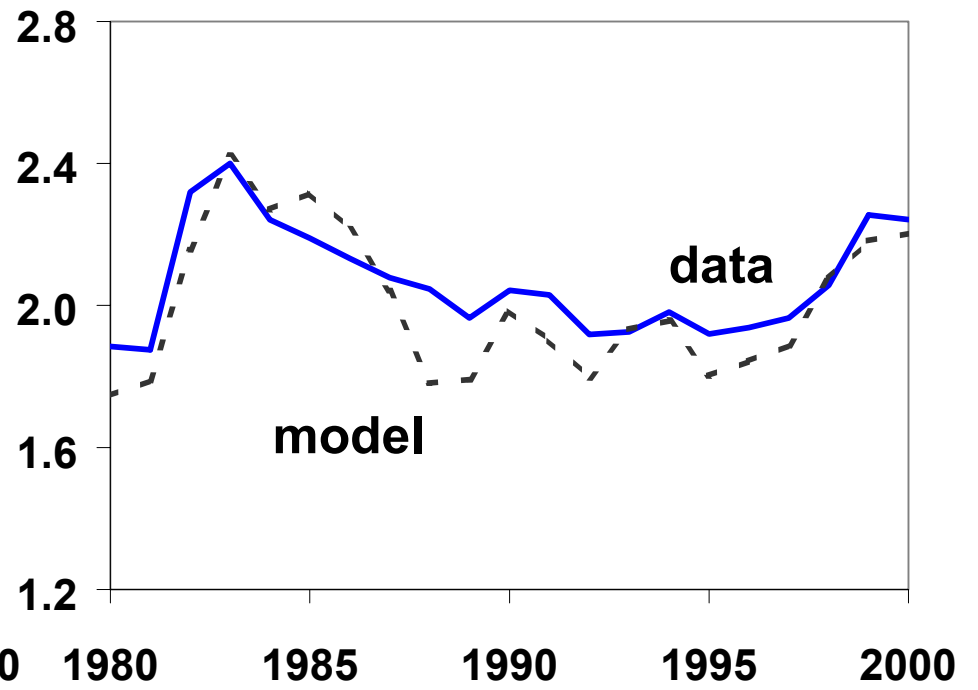
Base Case

K/Y



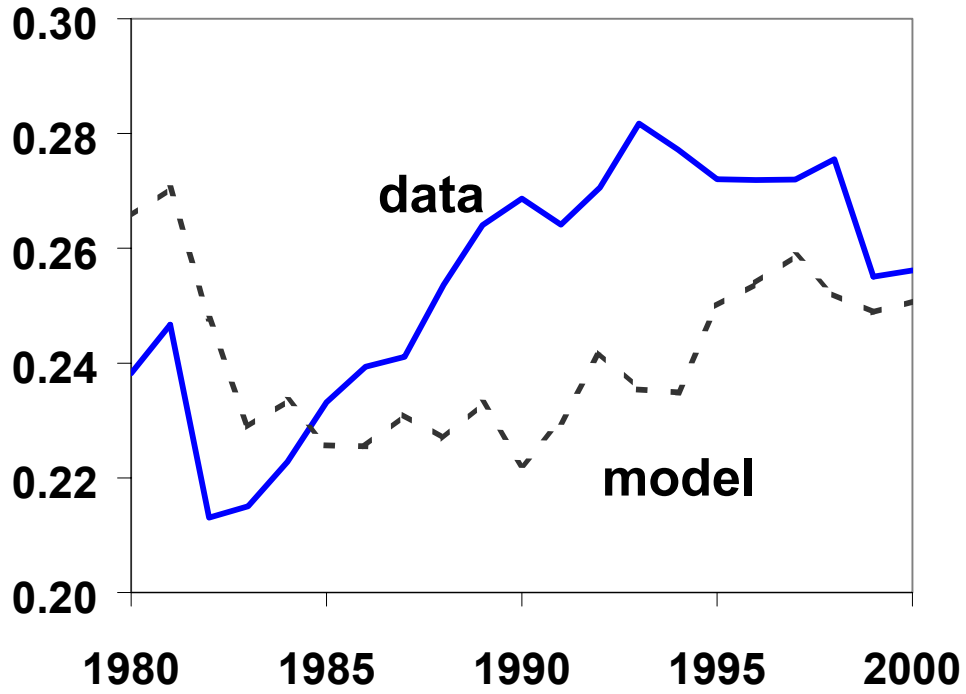
Tax Reform

K/Y



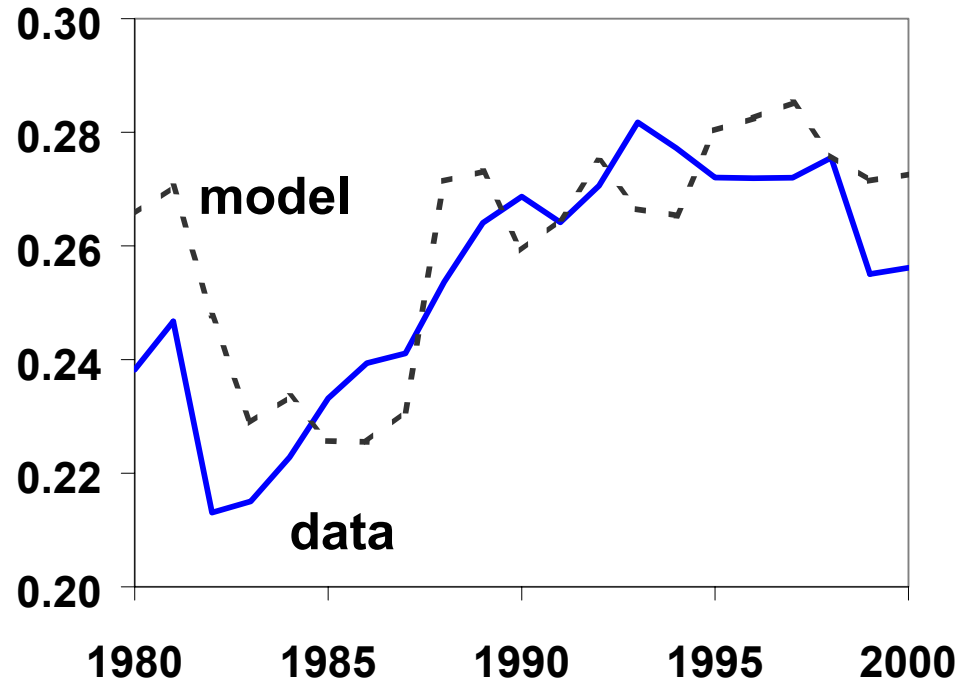
Base Case

L/N



Tax Reform

L/N



What do we learn from growth accounting and numerical experiments?

Nearly all of the differences in the recoveries in Mexico and Chile result from different paths of productivity.

Tax reforms are important in explaining some features of the recoveries, just not the differences.

Implications for studying structural reforms story:

- Only reforms that are promising as explanations are those that show up primarily as differences in productivity, not those that show up as differences in factor inputs.
- Timing of reforms is crucial if they are to drive the differences in economic performance.

Fiscal reforms

Chile:

- tax reforms 1975, 1984
- social security reform 1980
- fiscal surpluses

Mexico:

- tax reforms 1980, 1985, 1987, 1989
- fiscal deficits

Important, but not for explaining the differences!

Trade reforms

Chile: by 1979

- all quantitative restrictions eliminated
- uniform tariff of 10 percent
- tariff hikes during crisis — tariff back below 10 percent in 1991

Mexico: in 1985

- 100 percent of domestic production protected by import licenses
- nontariff barriers and dual exchange rates

Massive trade reforms in Mexico 1987-1994, culminating in NAFTA

Timing seems wrong!

Privatization

Chile

- major privatizations 1974-1979

Mexico

- major nationalization 1982
 - expropriated banks' holdings of private companies
 - government controlled 60-80 percent of GDP
- major privatizations after 1989

Timing seems wrong?

Banking

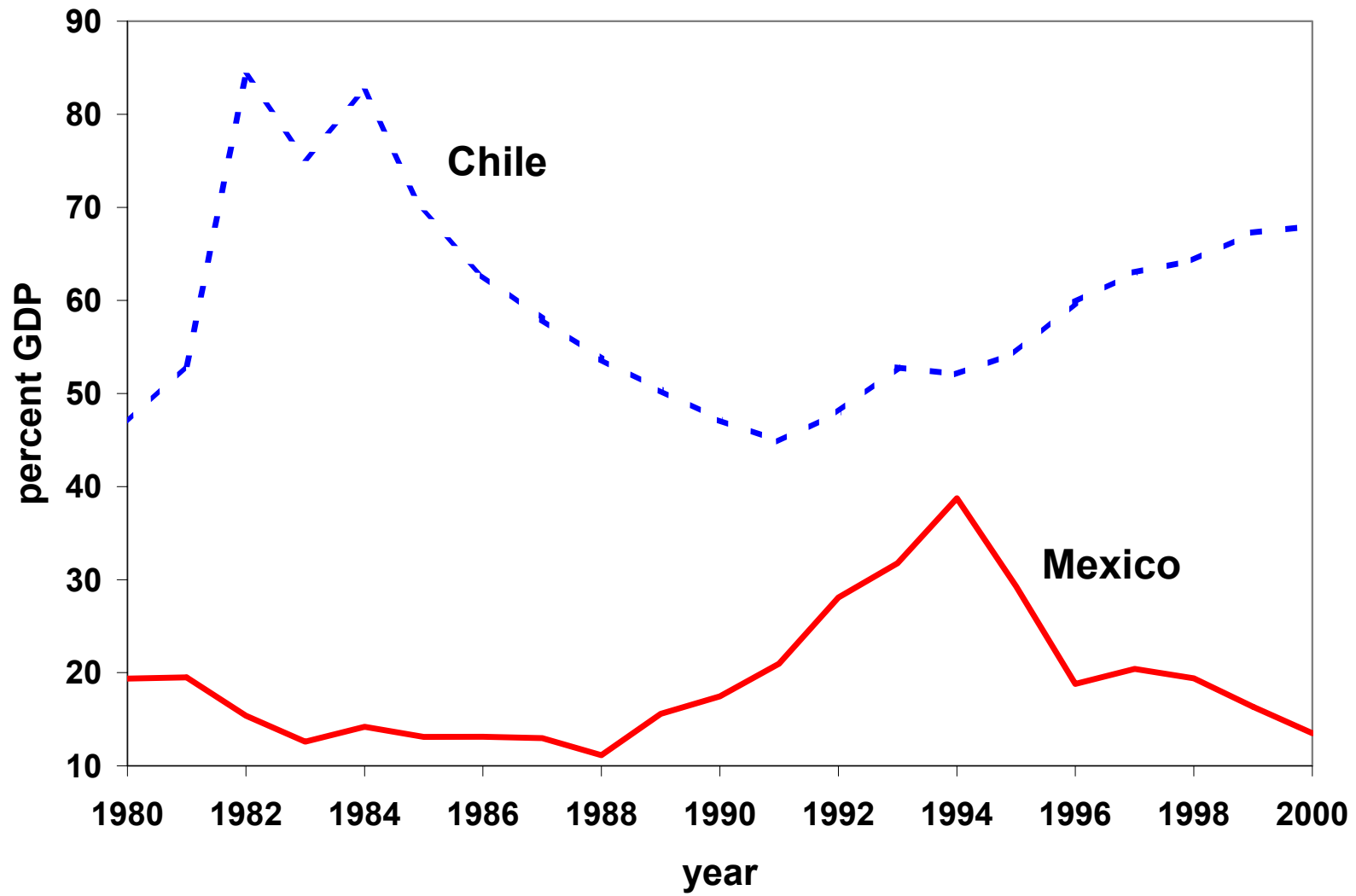
Chile: 1982 and after

- took over failed banks
- market-determined interest rates
- lowered reserve requirements.

Mexico: 1982 and after

- nationalized all banks
- government set low deposit rates
- 75 percent of loans either to government or directed by government.

Private credit as a percent of GDP



Banking in Chile

- hasty liberalization in 1975
 - poorly supervised *financieras*
 - explosion of *grupos*
 - bailouts – Banco Osorno in 1975 and CRAV grupo in 1978.
- better after crisis
 - takeover of distressed banks
 - debt restructuring
 - preferential exchange rate to repay dollar loans
 - recapitalization of banks
 - reprivatization of banks by 1985
 - tighter regulation and supervision.

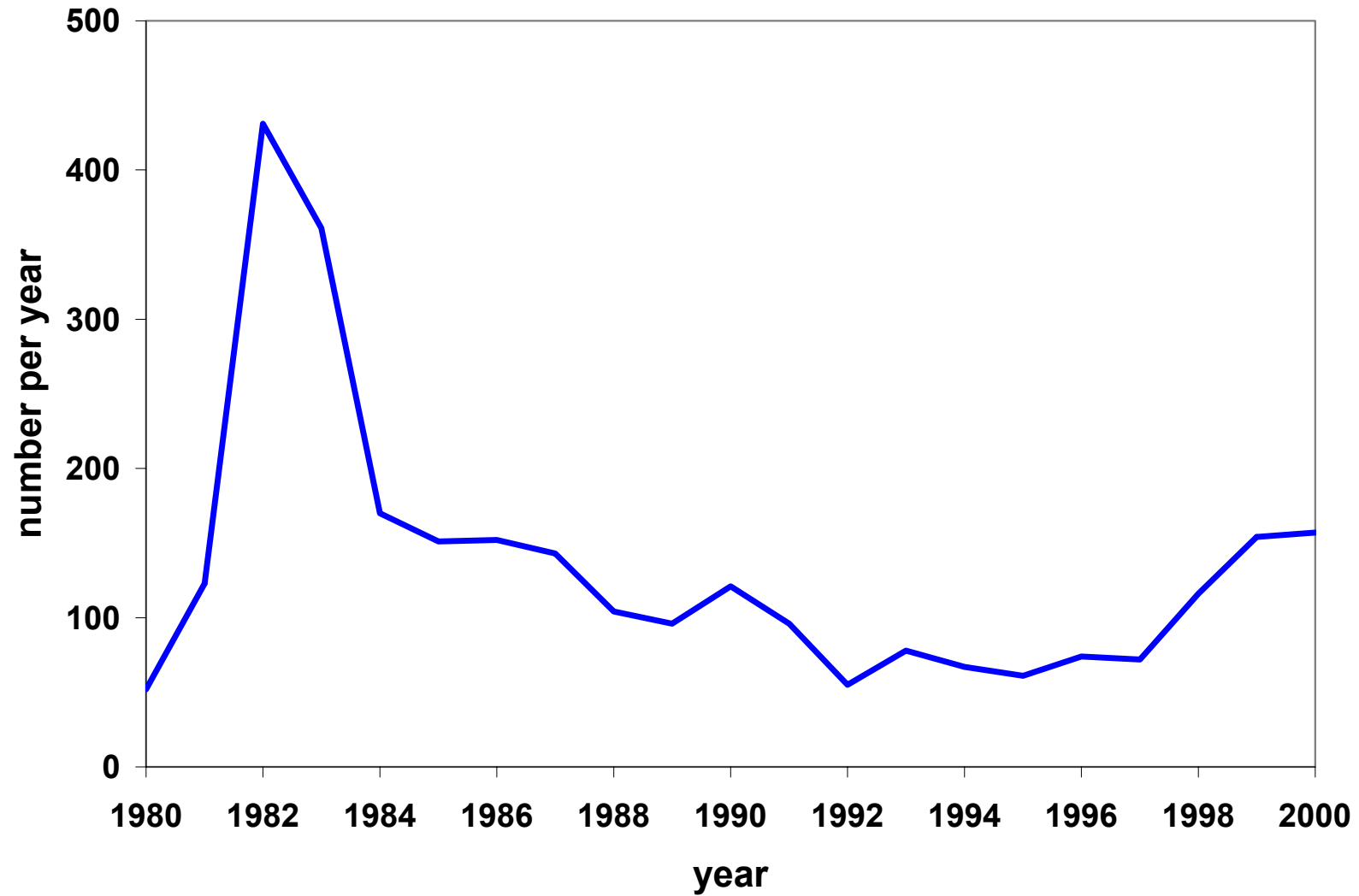
(These reforms were costly ~ 35 percent of one year's GDP.)

Bankruptcy laws

Chile had reformed the administration of its bankruptcy procedures in 1978. In 1982 it reformed its bankruptcy laws to look much like those in the United States.

Mexico reformed its bankruptcy procedures in a similar way only in 2000.

Business bankruptcies in Chile



How reforms can increase productivity

Suppose that $Y_i = A_i K_i^\alpha$, $i = 1, 2$. Sector 1 receives a subsidy of τ_1 on the interest rate that it pays on loans, and sector 2 pays a tax τ_2 :

$$\frac{\alpha A_1 K_1^{\alpha-1}}{(1 - \tau_1)} = \frac{\alpha A_2 K_2^{\alpha-1}}{(1 + \tau_2)} = r.$$

This leads to a misallocation of capital:

$$\frac{K_1}{K_2} = \left(\frac{A_1}{A_2} \right)^{\frac{1}{1-\alpha}} \left(\frac{1 + \tau_2}{1 - \tau_1} \right)^{\frac{1}{1-\alpha}}.$$

If these distortions decrease the incentives to make loans, then they can also lead to a lower level of overall capital and have an additional negative effect on output.

Models with dynamic inefficiencies

Atkeson and Kehoe (1995) and Chu (2001) — models with entry and exit of firms.

Each firm (plant) has its own level of productivity A and is operated by a manager.

$$y = A^{1-\nu} (k^\alpha l^{1-\alpha})^\nu.$$

A manager who decides to operate a plant chooses capital k and labor l to maximize static returns

$$d_t(A) = \max_{k,l} A^{1-\nu} (k^\alpha l^{1-\alpha})^\nu - r_t k - w_t l - w_t^m.$$

Let the solutions be $k_t(A)$ and $l_t(A)$.

For a given distribution $\lambda_t(A)$ of productivities across plants, aggregate output is $Y_t = \bar{A}_t^{1-\nu} K_t^\alpha L_t^{1-\alpha}$ where

$$\bar{A}_t = \int_A A \lambda_t(dA), K_t = \int_A k_t(A) \lambda_t(dA), L_t = \int_A l_t(A) \lambda_t(dA)$$

Over time, the productivity of each plant evolves stochastically:
 $A' = A\varepsilon$ where ε is drawn from $\pi(\varepsilon)$.

Decision for the manager of whether or not to operate a plant is dynamic and is described by the Bellman equation

$$V_t(A) = \max[0, V_t^o(A)] \text{ where } V_t^o(A) = d_t(A) + \frac{1}{1+R_t} \int_{\varepsilon} V_{t+1}(A\varepsilon) \pi(d\varepsilon).$$

The outcome of all the managerial decisions to operate or not is a new distribution $\lambda_{t+1}(A)$ over productivities in period $t + 1$.

Imagine that banking system provides subsidized loans to some firms and not to others and that bankruptcy procedures make it difficult for firms to exit and/or subsidize inefficient firms.

How would the removal of distortions in the banking system and bankruptcy procedures affect the path of productivity over time?

Some effects would be immediate. Upon removal, some previously favored firms that would have continued will fail, and some unfavored firms that would have failed will continue.

The more subtle, and potentially more important, effects take more time to show up in aggregates. The removal of distortions would encourage new firms to enter. Such new firms would have the newest technologies, but would build up their organization-specific productivity only slowly over time. (Generalization of model with age-specific $\pi(\varepsilon)$.)

Bottom line

Different recoveries due to

- Chile reaping benefits of reforms
- Mexico paying costs for distortions

Not due to

- money
- real exchange rates
- debt overhang

Reforms in banking and bankruptcy procedures more important than those in fiscal policy, in trade policy, and (probably) in privatization for explaining different recoveries.

**What Can We Learn
From the Current Crisis in Argentina?**

Timothy J. Kehoe

University of Minnesota
and
Federal Reserve Bank of Minneapolis

June 2003, UPF

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.



5

PROVINCIA DE BUENOS AIRES

LETRA DE TESORERIA PARA
CANCELACION DE OBLIGACIONES

B 06515380 (PATACON)

B 06515380

AL PORTADOR

LEY N° 12.774

5

PESOS



Victor E. Pereira
Victor E. Pereira
Consejero General de la
Provincia de Buenos Aires

Arnáez Zufrengui
Arnáez Zufrengui
Tesorero General de la
Provincia de Buenos Aires



DARDO ROCHA

CINCO PESOS
VALOR NOMINAL



LEY N° 12.774

ARTICULO 14°: "Apruébase la emisión de Letras de Tesorería para Cancelación de Obligaciones, denominadas "Patacón 2", que podrán emitirse en una o varias series, tendrán vencimiento en un plazo máximo de CINCO (5) años contados desde la fecha de su emisión y serán rescatados a un valor equivalente al 135% de su valor nominal... serán emitidas bajo las modalidades de los Artículos 742, 744 y 745 del Código de Comercio."

ARTICULO 15°: "Las disposiciones previstas para el Patacón... serán aplicables al Patacón 2. En particular, los tenedores del "Patacón 2" podrán aplicarlas, a su valor nominal, al pago de obligaciones con la Provincia de Buenos Aires."

RESOLUCION DEL MINISTRO DE ECONOMIA DE LA PROVINCIA DE BUENOS AIRES N° 300/01

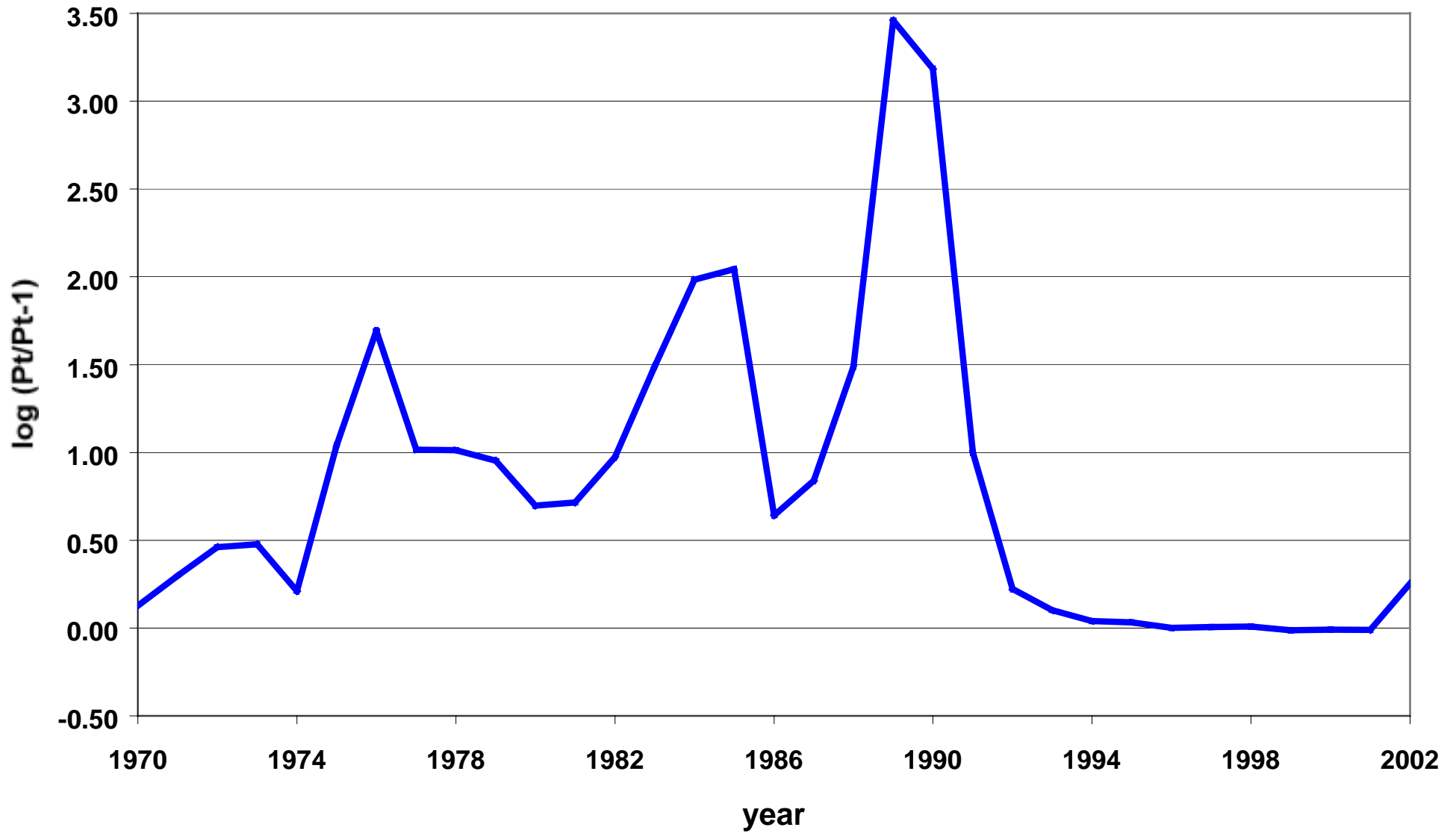
ARTICULO 1°: "Autorízase a la Tesorería General de la Provincia... a ordenar la emisión de Letras de Tesorería para Cancelación de Obligaciones, denominadas "Patacón 2", cuya fecha de vencimiento será el 13 de Noviembre de 2006."

5

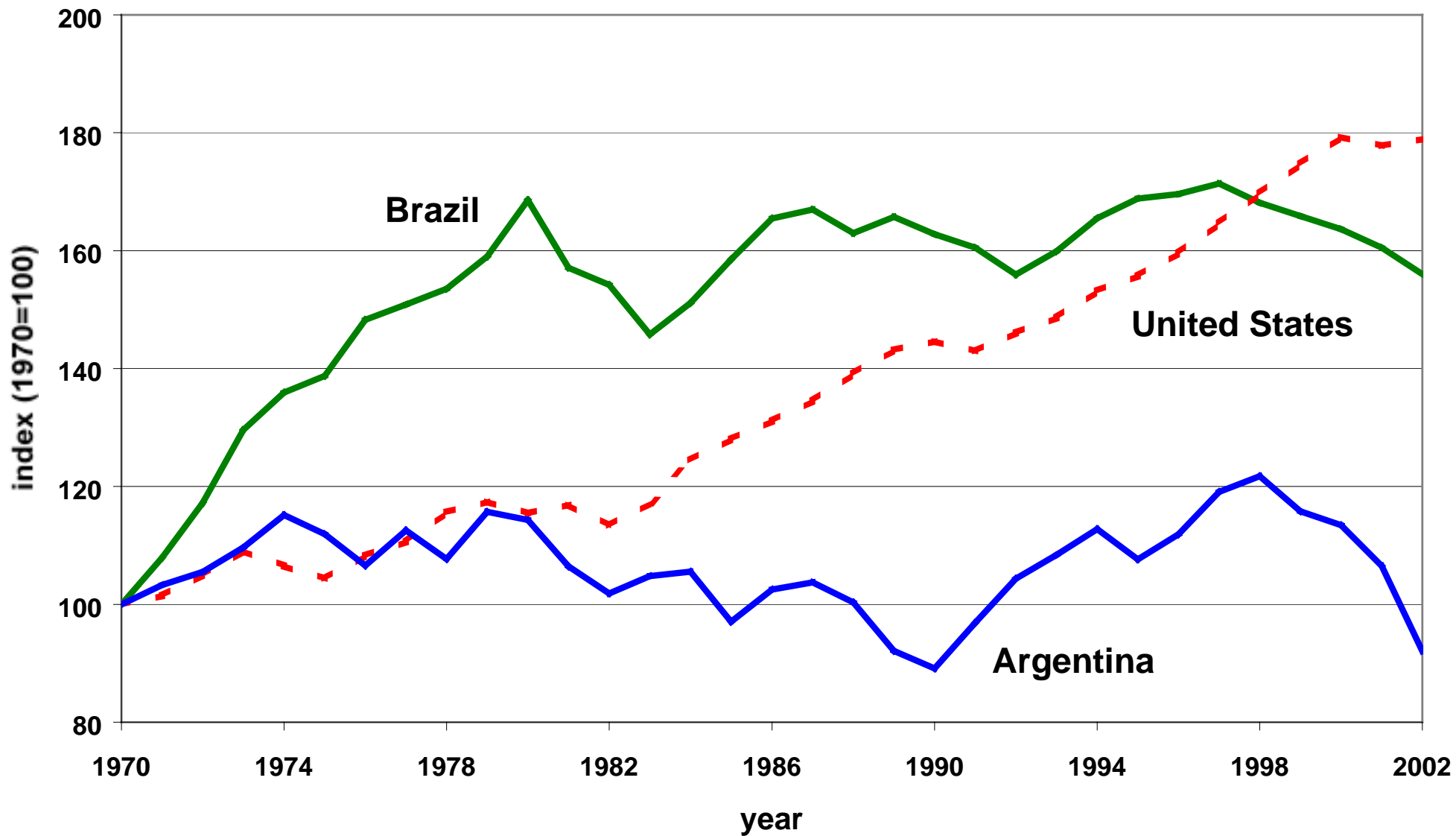
PESOS



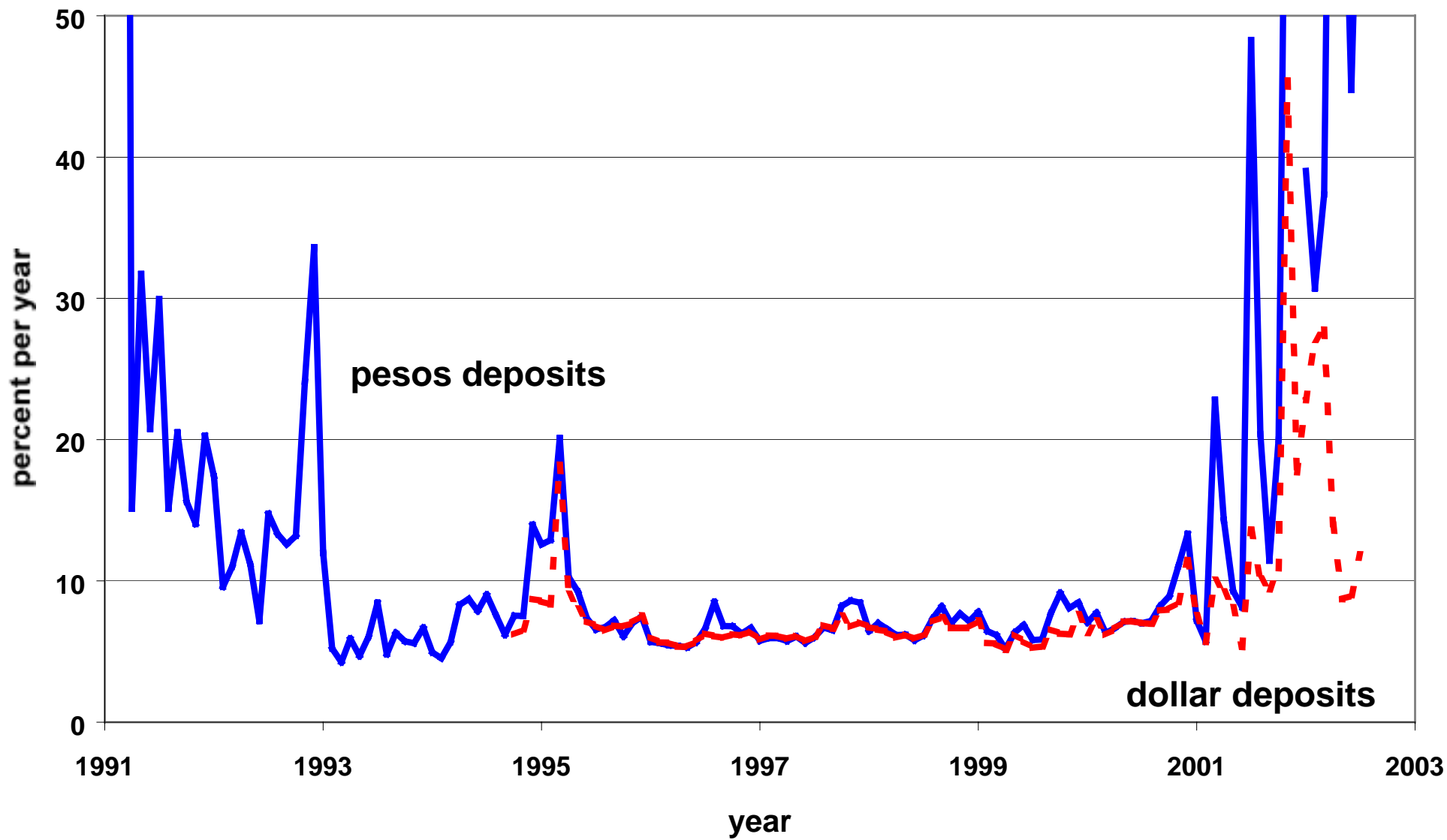
Consumer Price Inflation



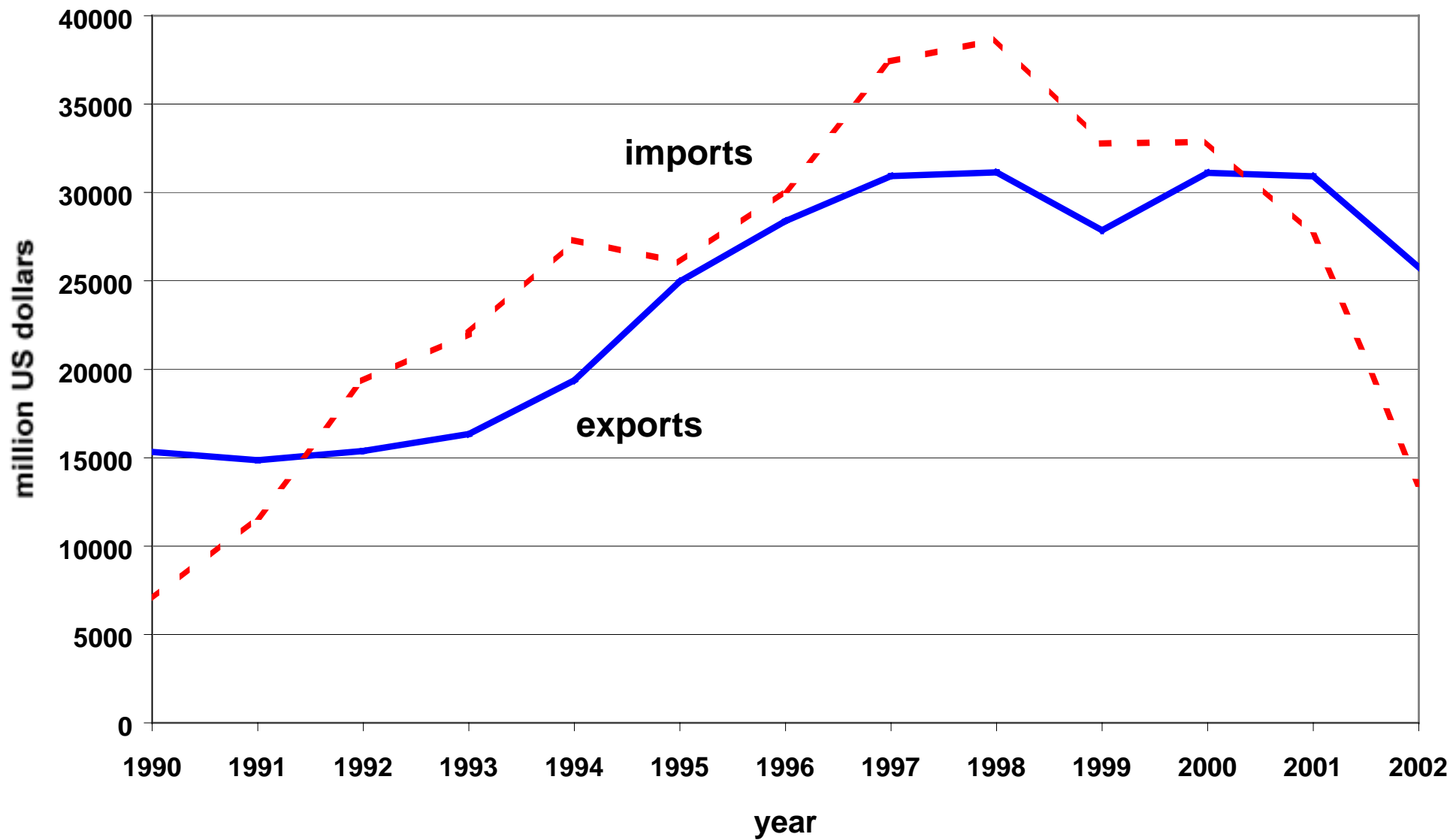
Real GDP per Working Age (15-64) Person



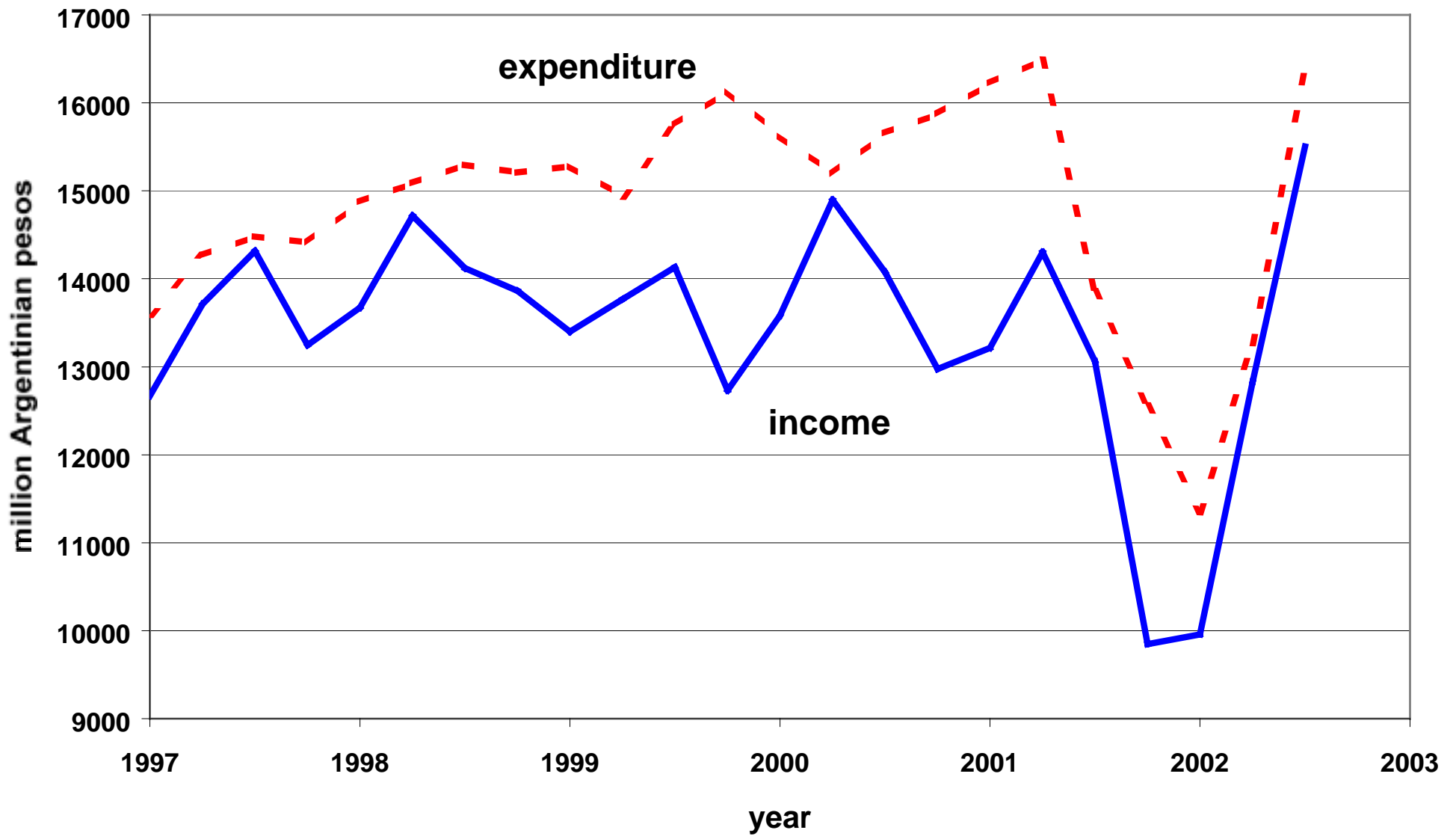
Money Market Interest Rates



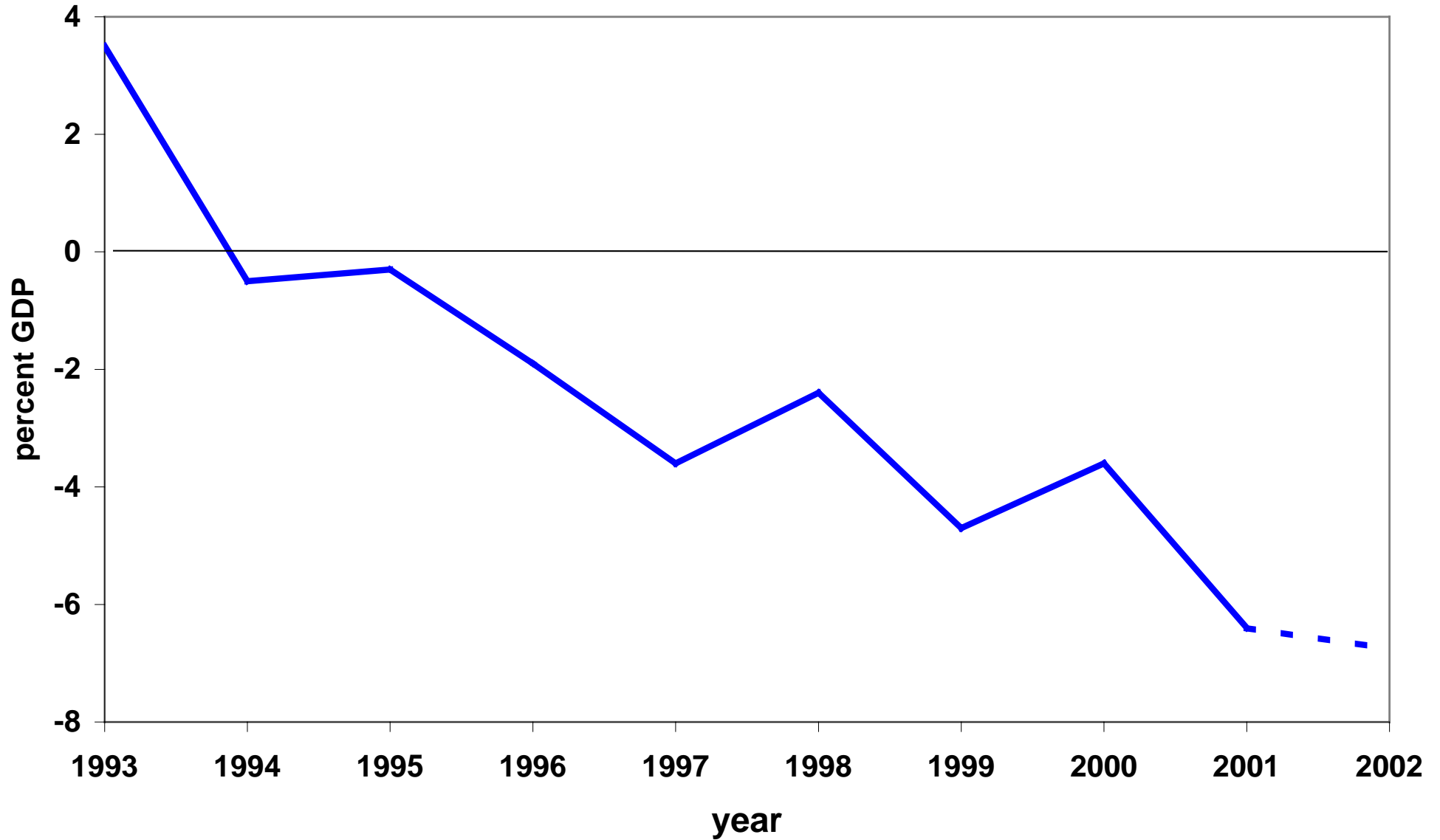
Foreign Trade in Argentina



Federal Government Finances



Overall Governemnt Balance (Including Off Budget Items)



Growth Accounting / Applied General Equilibrium Exercise

Isolate the factors responsible for the Argentinian depression:
factor inputs or something else?

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:

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

Calibration

First order conditions:

$$\frac{1}{C_{t-1}} = \frac{\beta}{C_t} [1 + r_t - \delta]$$

$$\frac{1-\gamma}{hN_t - L_t} = \frac{\gamma w_t}{C_t}$$

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

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

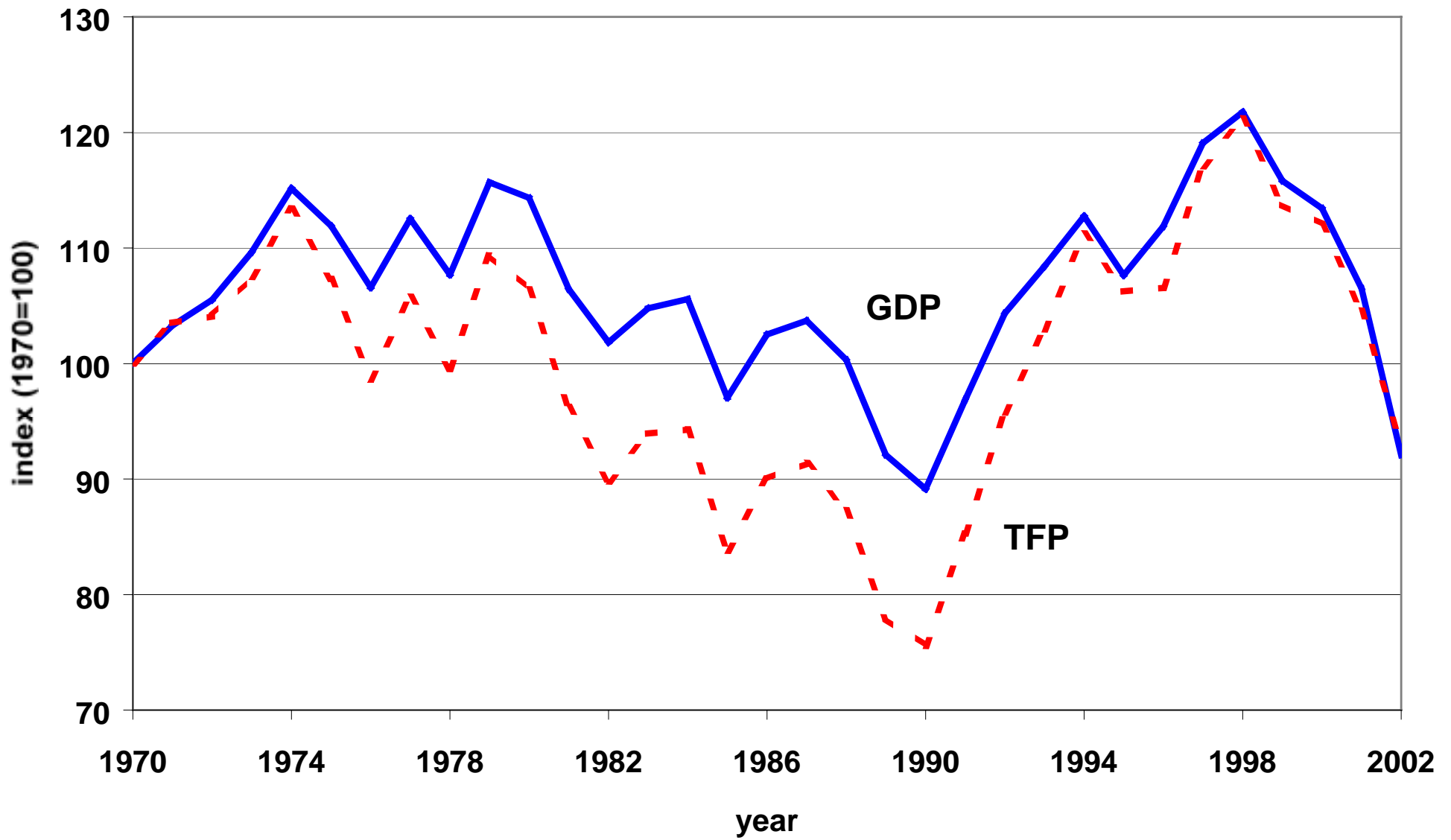
For $0 < \eta \leq 1$, $\phi'(X/K) > 0$, $\phi''(X/K) \leq 0$, $\phi(\delta) = \delta$, $\phi'(\delta) = 1$.

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

In numerical experiments $\eta = 0.8$.

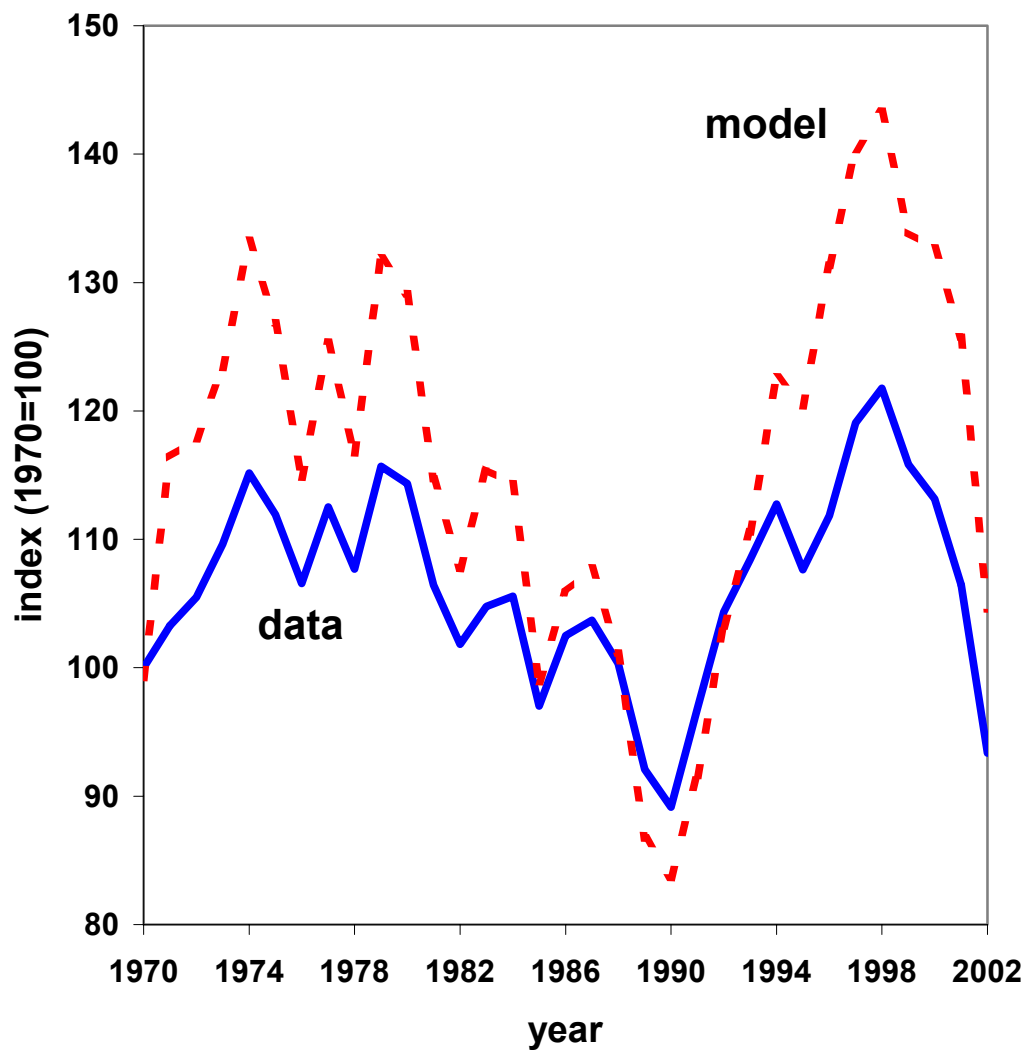
Should we model rigidity in the labor market (instead)?

Real GDP Per Working Age Person and Total Factor Productivity

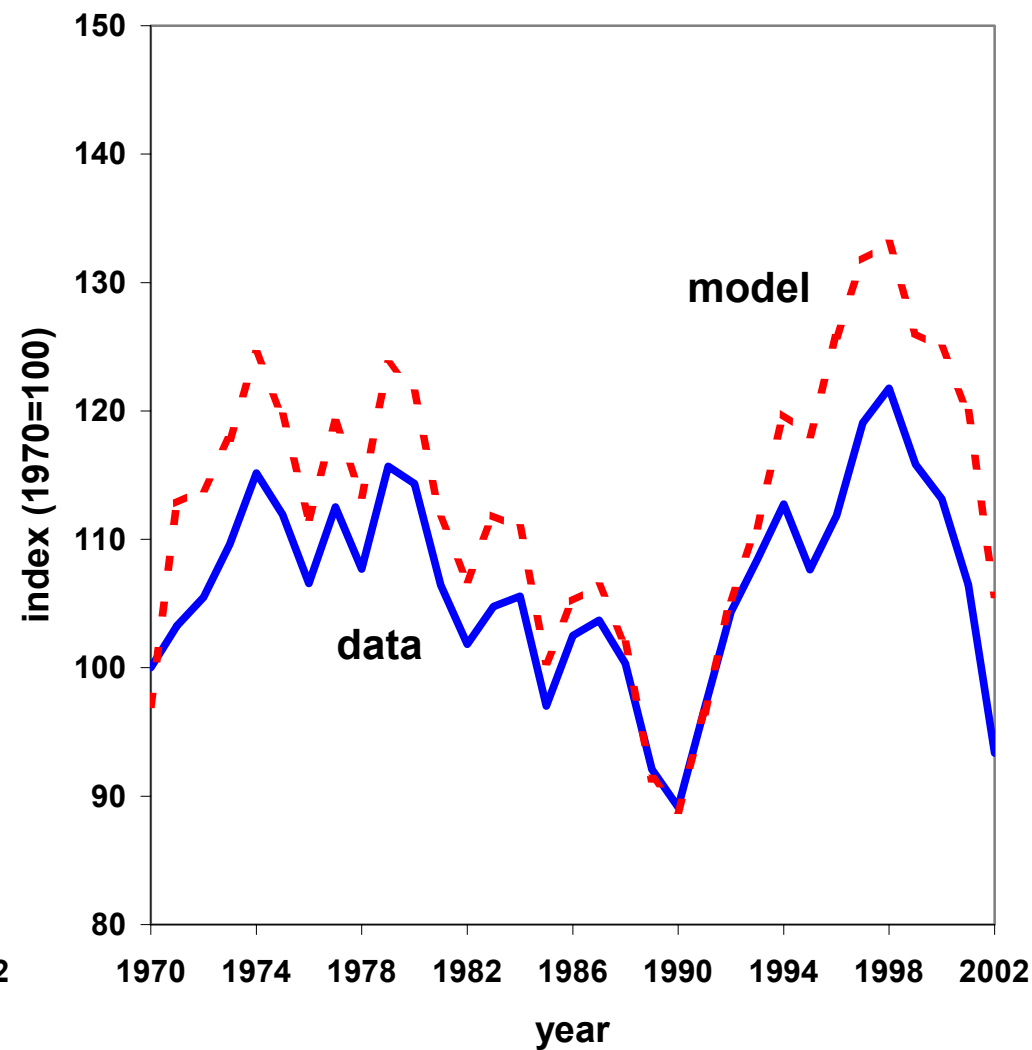


Real GDP per Working- Age Person

Base Case Model

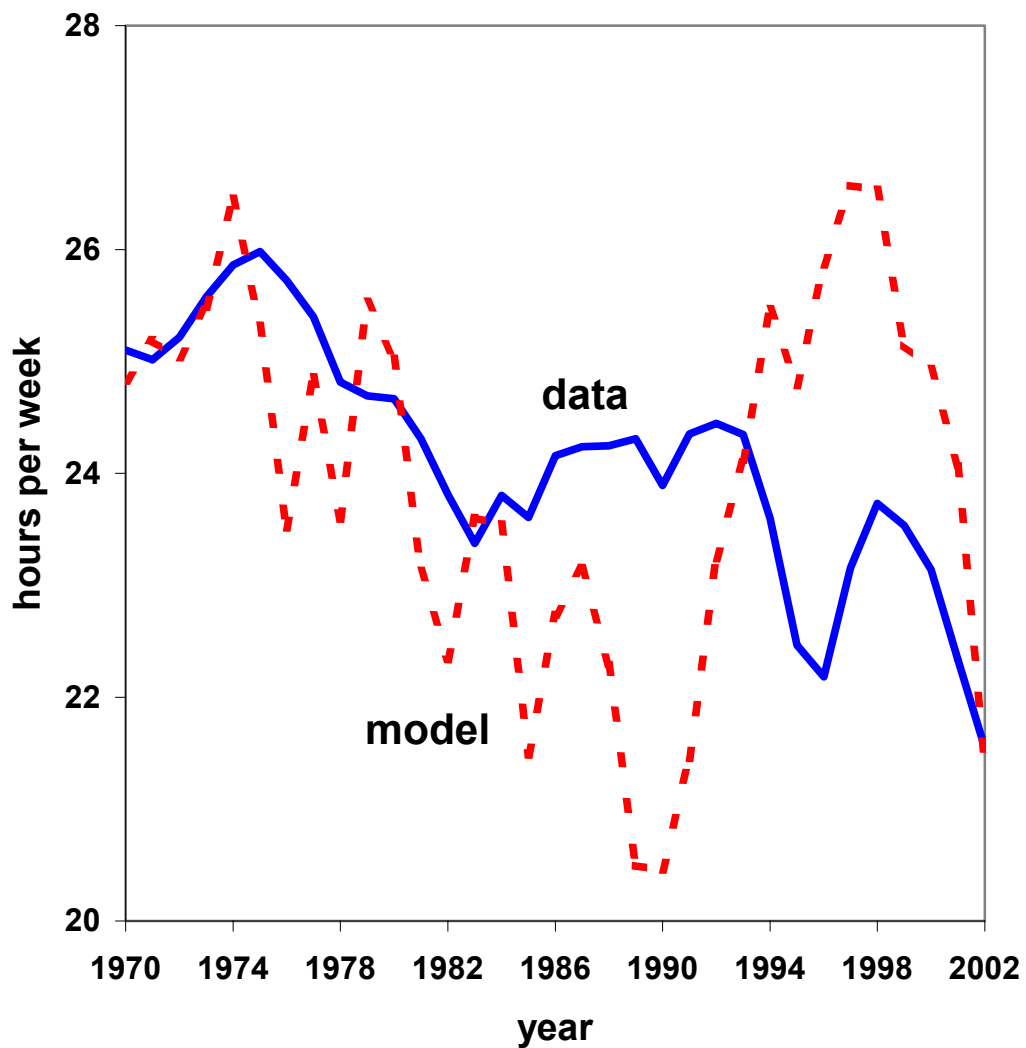


Model with Adjustment Costs

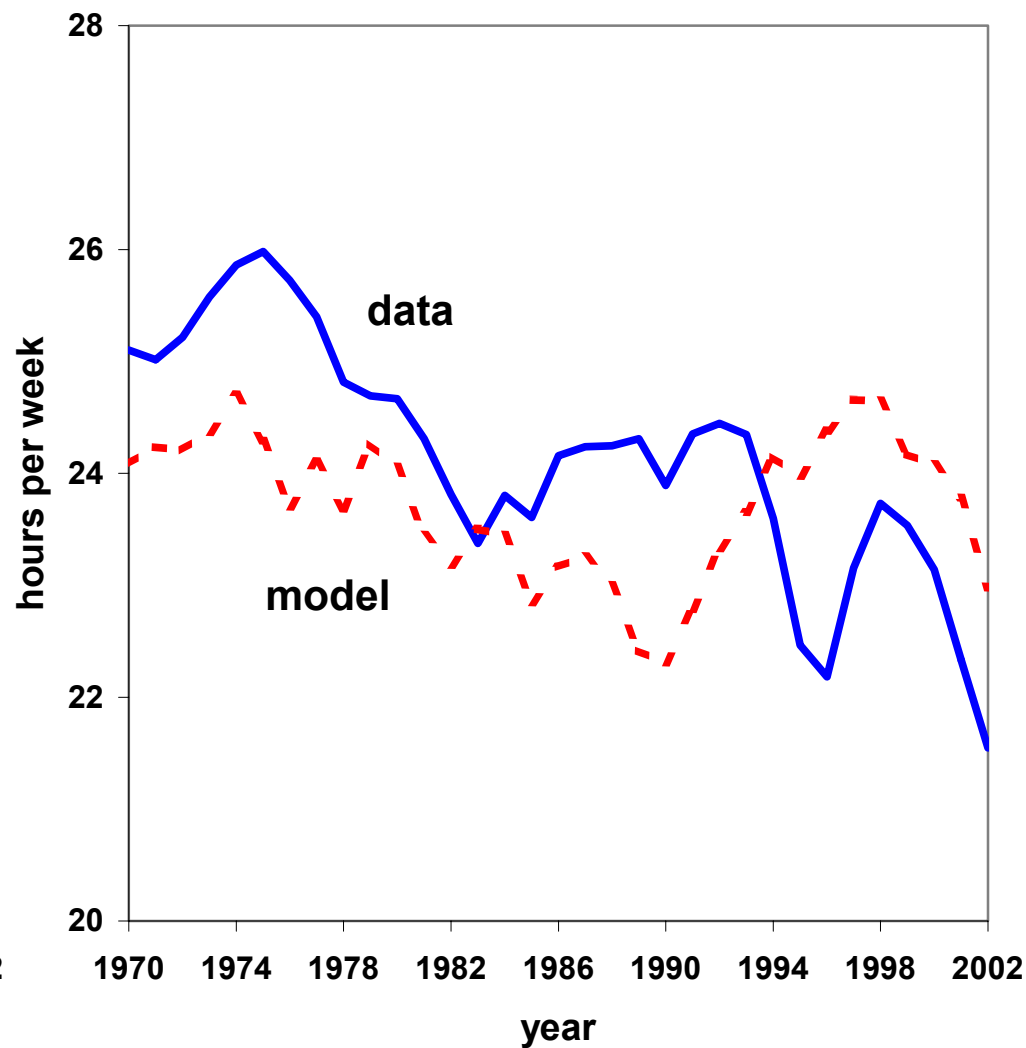


Hours Worked per Working-Age Person

Base Case Model

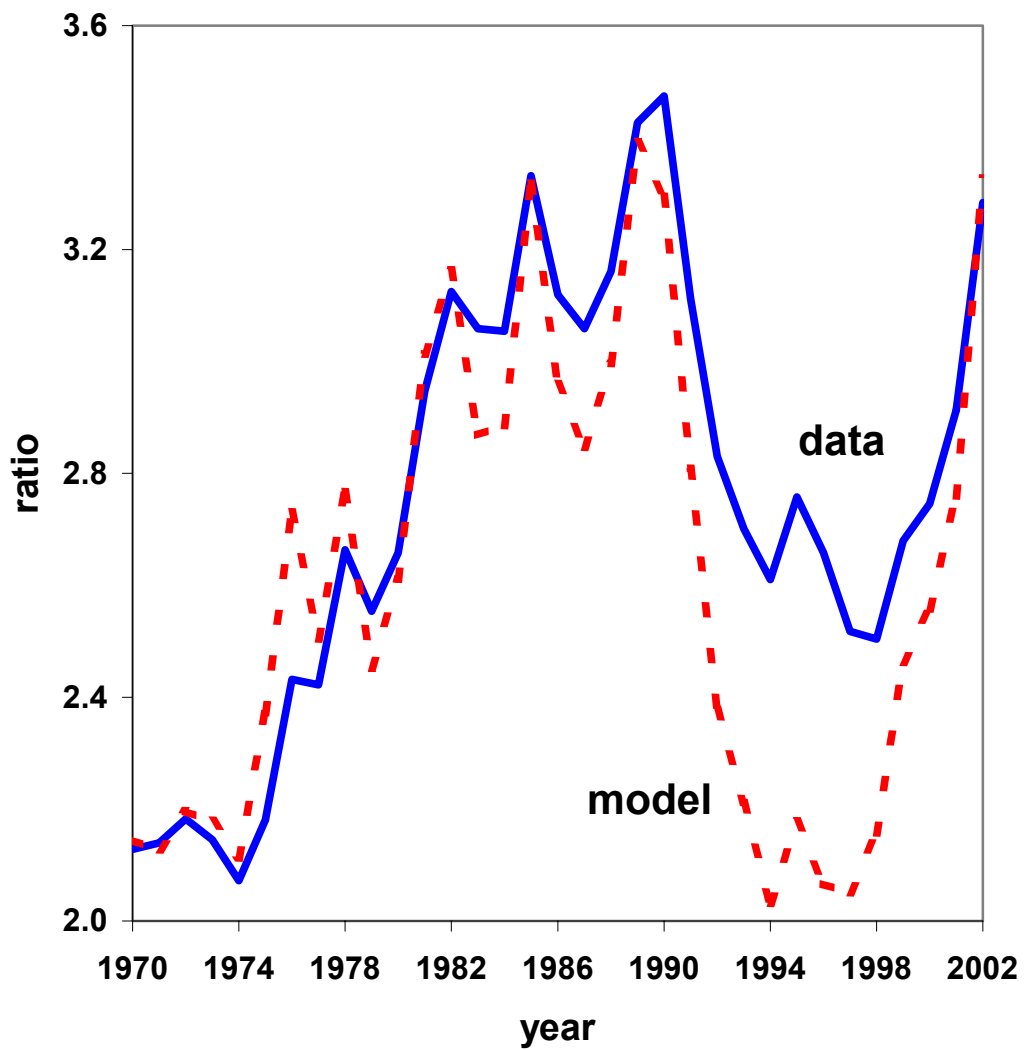


Model with Adjustment Costs

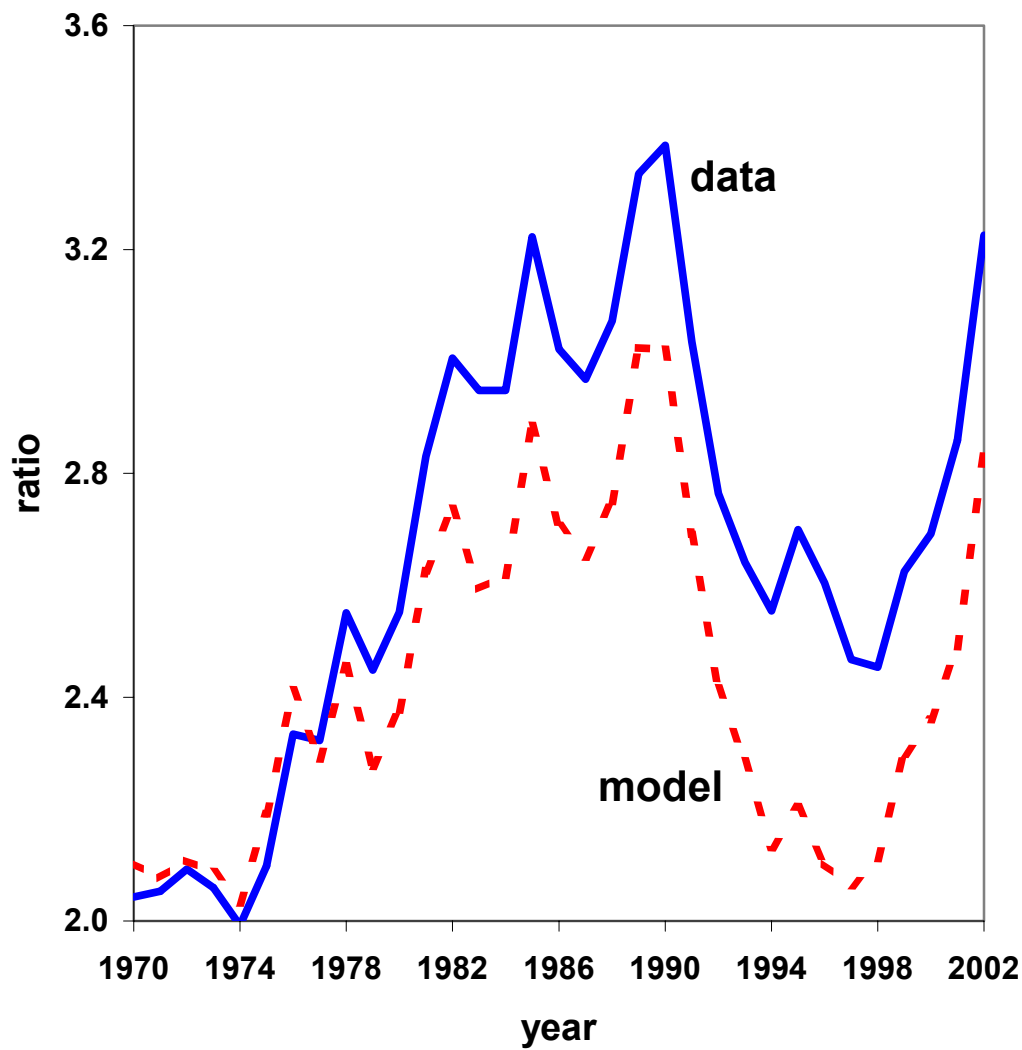


Capital-Output Ratio

Base Case Model

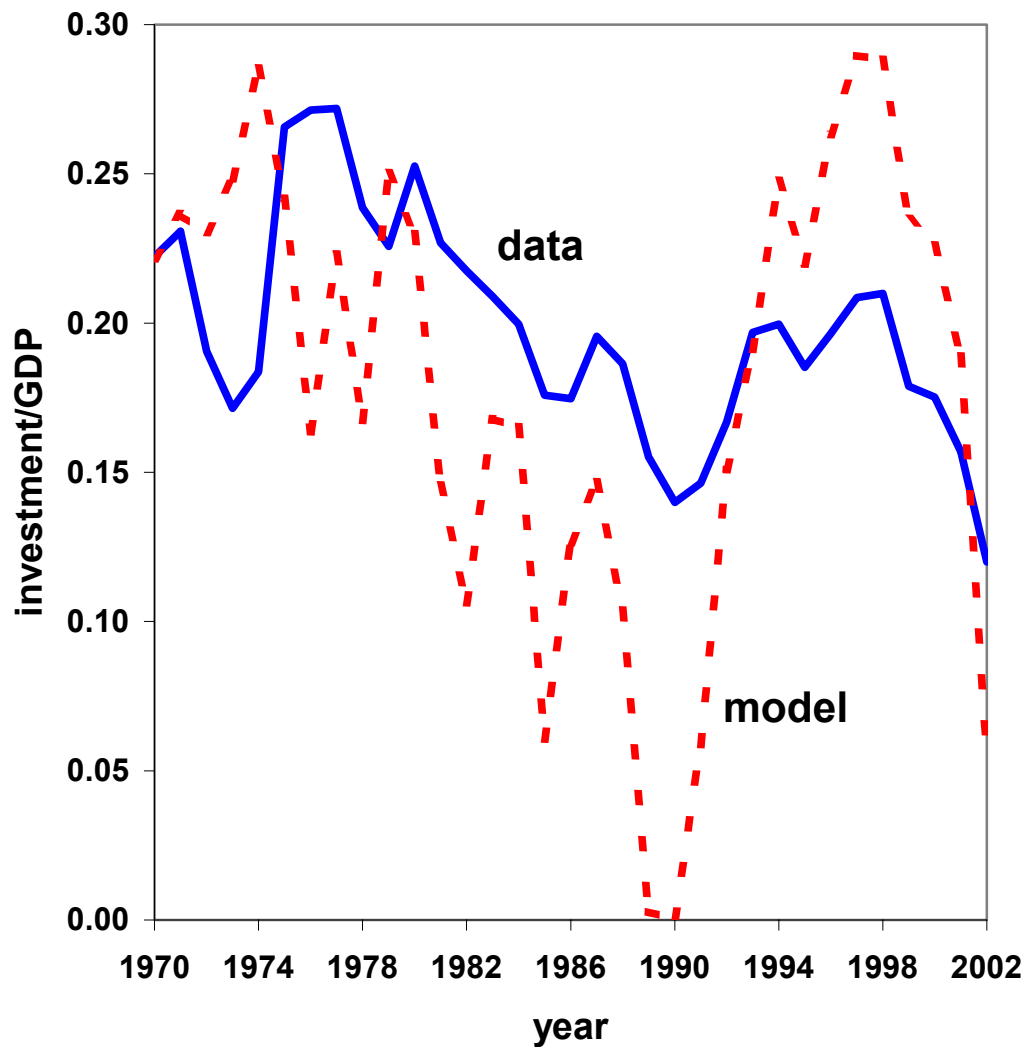


Model with Adjustment Costs

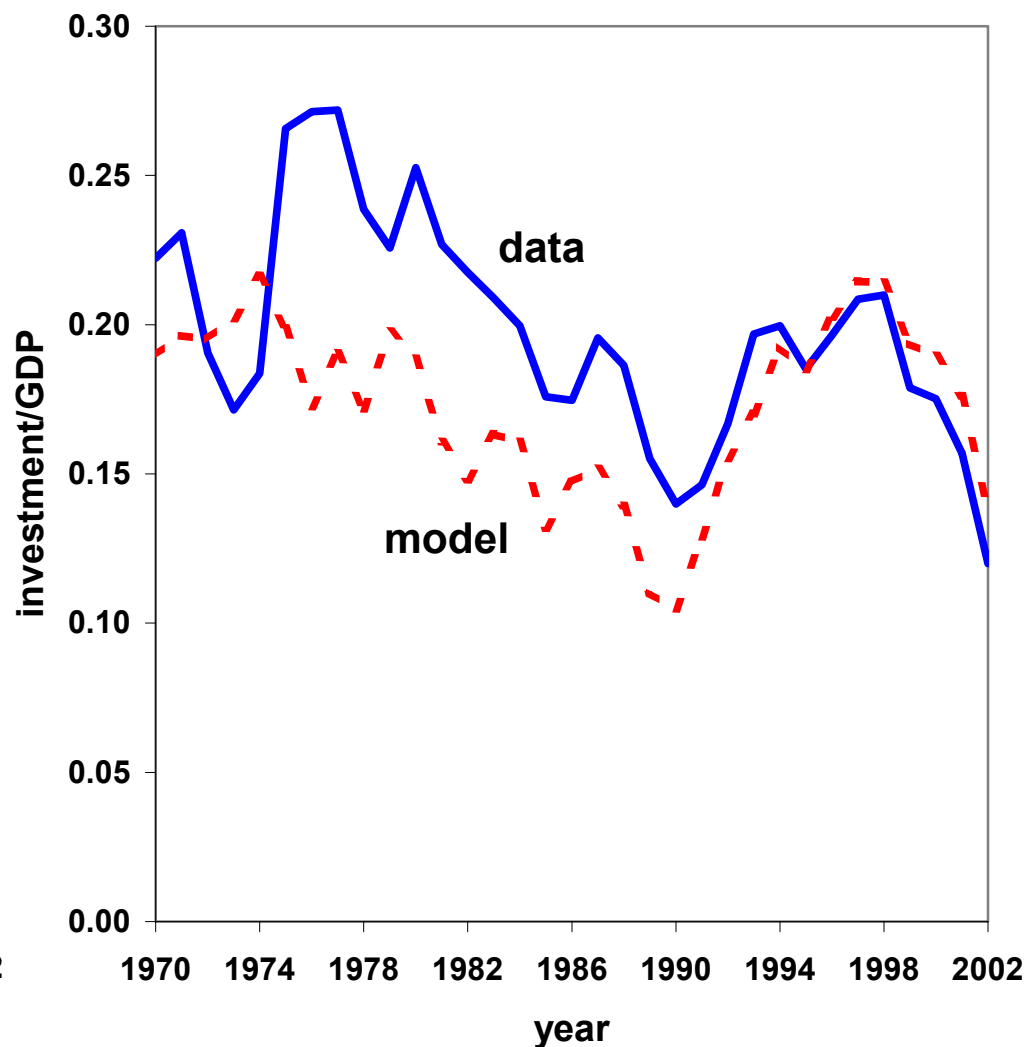


Investment Rate

Base Case Model



Model with Adjustment Costs



Lessons for monetary policy

Increasing the costs of abandoning a policy can reduce the set of conditions under which a crisis can occur. If these increased costs do not rule out a crisis completely, however, they can backfire in making the economy far worse off if things do go wrong.

Rogoff's (1985) (and, more recently, Woodford's 2002) proposal to reduce the dynamic consistency problem in monetary policy making is to employ a "conservative" central banker, one whose social welfare function puts far more weight on price stability than does the general population's. This is what the De la Rúa administration tried to do in bringing in Domingo Cavallo as Economics Minister in early 2001.

Dynamic consistency problems are pervasive because commitment is not easy. Lack of political consensus both within the federal government and between the federal and the provincial governments in Argentina made it impossible to resolve fiscal imbalances. In this environment, “unpleasant monetarist” arithmetic doomed the Convertibility Plan to failure. Measures that the administration had put in place to make the Convertibility Plan more credible are imposing severe costs on the economy now that the plan has failed.

A final note

They say that every dark cloud has a silver lining, but it is hard to have much optimism about the Argentinian economy. Nevertheless, the pervasiveness of time consistency problems may soon produce one favorable for Argentina: Up until recently, both the Bush administration and the International Monetary Fund in the person of its new Managing Deputy Director Anne Krueger claimed to be committed to a policy of “no more bailouts” for countries like Mexico and Korea that run into financial crises of their own making. Early last month, however, the IMF, with the backing of the U. S. government, announced large loan packages for Brazil and Argentina. Negotiations for another package for Argentina are currently underway.