

# Money, Sticky Wages, and the Great Depression

*American Economic Review, 2000*

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# Introduction

## Motivation

- Great Depression and sticky wages

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- Great Depression and sticky wages
- Effect of Monetary Policy

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## Background

- Banking Crisis

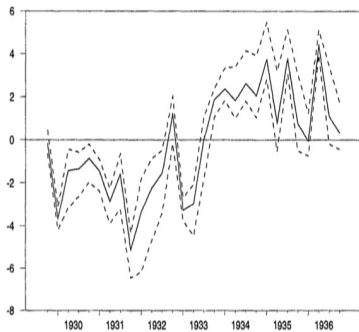


FIGURE 4. MONEY GROWTH INNOVATIONS, 1929–1936

# Introduction

## Background

- Banking Crisis
- Federal Reserve Credit Supply

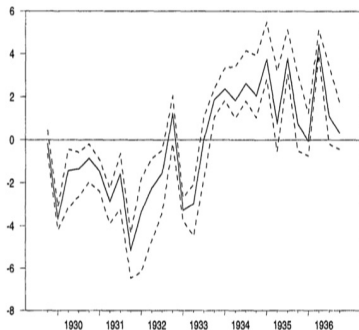


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## Background

- Banking Crisis
- Federal Reserve Credit Supply
- Remonetization

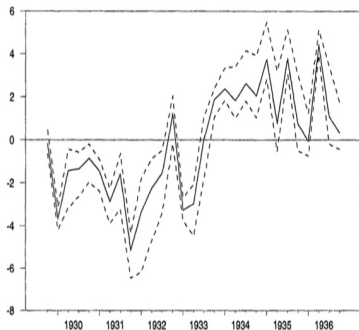


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## Background

- Banking Crisis
- Federal Reserve Credit Supply
- Remonetization
- National Industrial Recovery Act (NIRA)

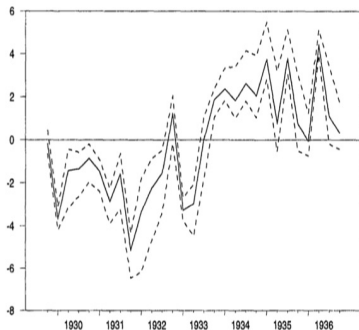


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# Model

## Model Overview

- New-Keynesian Model



- New-Keynesian Model
  - Money

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  - Foundations in Microeconomics

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  - Firms maximize profit

# Model

## Households Maximize Utility

$$\underset{C_t, M_t, B_t, K_{t+1}}{\text{Max}} \quad U = E_0 \sum_{t=0}^{\infty} \beta^t U \left( C_t, \frac{M_t}{P_t} \right)$$

- $\beta$  Discount Factor
- $C$  Real Consumption
- $M$  End-of-period nominal cash balances
- $P$  Price level

# Model

## Households Maximize Utility

$$\underset{C_t, M_t, B_t, K_{t+1}}{\text{Max}} \quad U = E_0 \sum_{t=0}^{\infty} \beta^t U \left( C_t, \frac{M_t}{P_t} \right)$$

Subject to

$$B_t = B_{t-1} + \underbrace{(R_{t-1}B_{t-1} + W_t L_t + J_t K_t + \pi_t + X_t)}_{\text{Income}} - \underbrace{(P_t C_t + P_t I_t + M_t - M_{t-1})}_{\text{Expenditures}}$$

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

- $B$  Nominal bond holdings
- $R$  Nominal interest rate
- $L$  Total hours worked
- $J$  Nominal rental price of capital
- $\pi$  Nominal firm profits
- $X$  Lump sum cash transfers from government

# Model

Firms Maximize Profit - No adjustment costs

$$\underset{K,L}{\text{Max}} \pi = E_0 \sum_{t=0}^{\infty} \psi_t [P_t K_t^\theta L_t^{1-\theta} - W_t L_t - J_t K_t]$$

- $K$  = Capital
- $L$  = Labor
- $W$  = Wage rate
- $J$  = Capital rental rate
- $\psi$  = Stochastic discount factor



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Firms Maximize Profit - Adjustment costs

$$\begin{aligned} \text{Max}_{K,L} \pi = E_0 \sum_{t=0}^{\infty} \psi_t [ & P_t K_t^\theta \left( L_t - \frac{q_L}{2} \frac{(L_t - L_{t-1})^2}{L_{t-1}} \right)^{1-\theta} \\ & - W_t L_t - J_t K_t ] \end{aligned}$$

- $K$  = Capital
- $L$  = Labor
- $W$  = Wage rate
- $J$  = Capital rental rate
- $\psi$  = Stochastic discount factor
- $q_L$  = Adjustment costs

# Model

## Taylor wage contracts

$$\ln(x_t) = \phi_0 \ln(W_t) + \gamma(L_t - \bar{L})$$

$$+ E_t \left[ \begin{array}{l} \phi_1 \ln(W_{t+1}) + \gamma(L_{t+1} - \bar{L}) \\ + \phi_2 \ln(W_{t+2}) + \gamma(L_{t+2} - \bar{L}) \\ + \phi_3 \ln(W_{t+3}) + \gamma(L_{t+3} - \bar{L}) \end{array} \right]$$

- $x_t$  = Contract wage
- $W_t$  = Average wage of all cohorts
- $L_t$  = Labor force
- $\bar{L}_t$  = Natural rate of employment
- $\phi$  = Degree of forward looking behavior
- $\gamma$  = Speed of wage adjustments

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- 4 Cohorts
- 4 Quarterly adjustments

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$$g_{t+1} = g_0 + \rho g_t + \epsilon_{t+1}$$

$$g_t = \ln(M_t) - \ln(M_{t-1})$$

# Calibration and Estimation

Key parameters



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- $\rho =$  Monetary shocks
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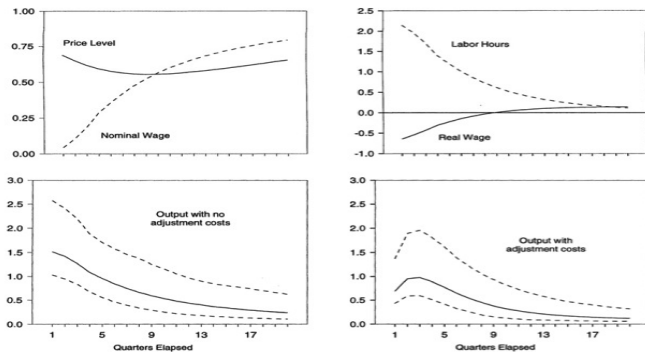
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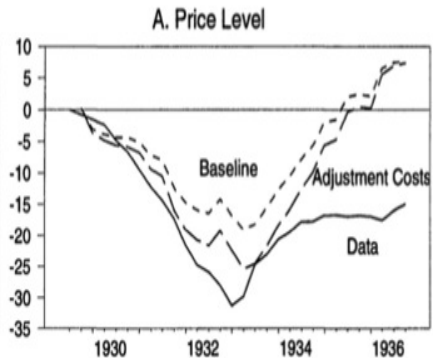
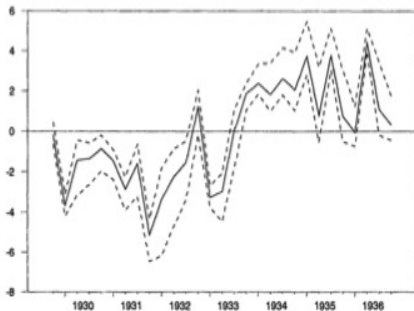
- $\rho =$  Monetary shocks
  - Estimated from data
- $q_L =$  Adjustment costs
  - Chosen ( $q_L = 0.7$ )
- $\gamma =$  Wage contract sensitivity
  - Backed out
  - (chosen to minimize variance between model's simulation and data)

Figure: Model prediction with sticky wages



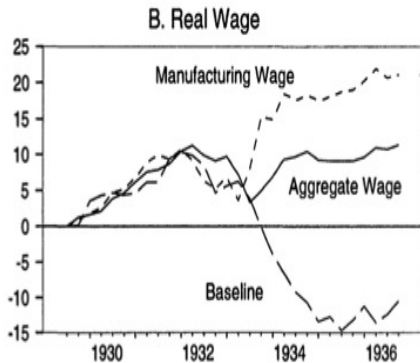
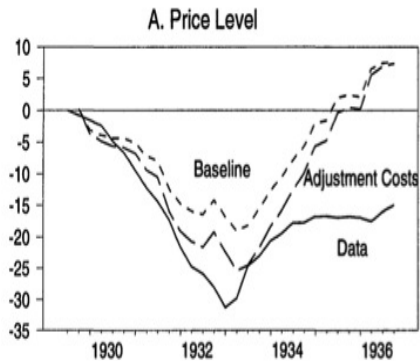
# Simulation

## Money Supply and Price Level



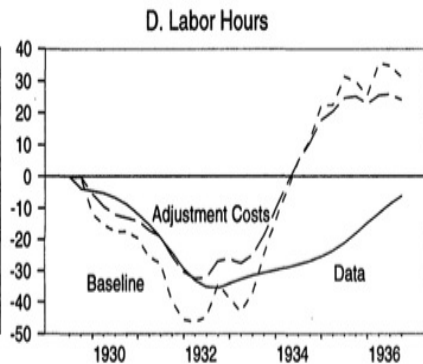
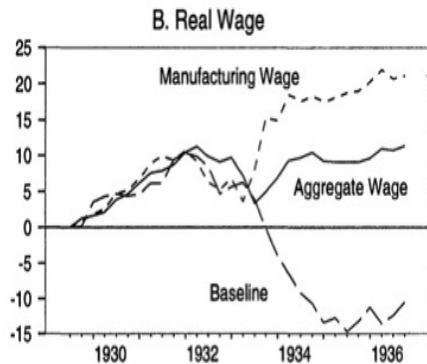
# Simulation

Price level and Real wages



# Simulation

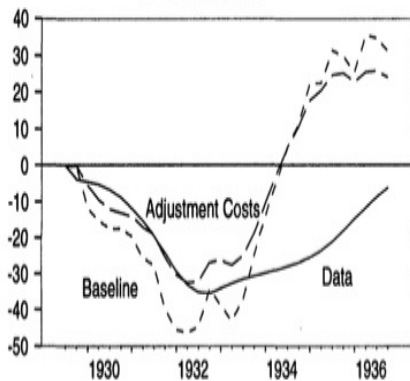
Real wages and Labor hours



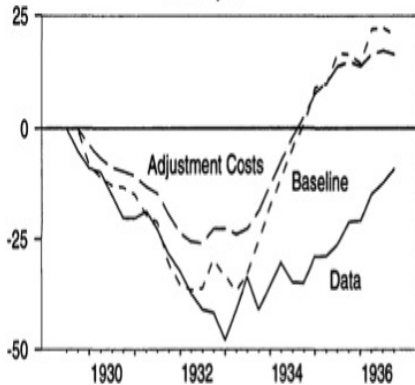
# Simulation

Labor hours and Output

D. Labor Hours



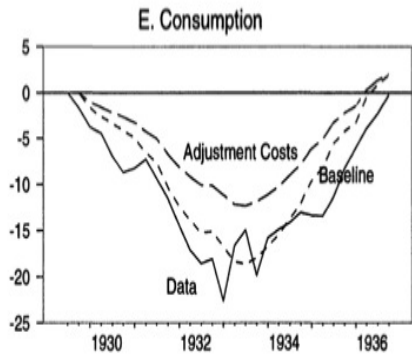
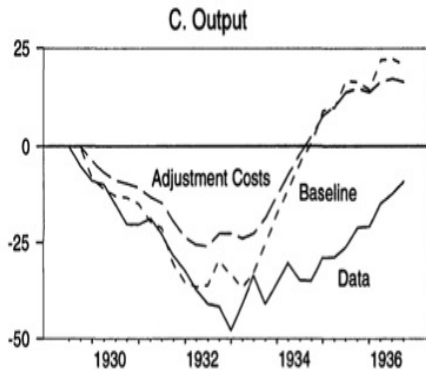
C. Output





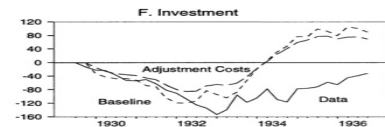
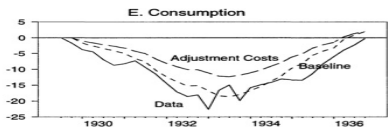
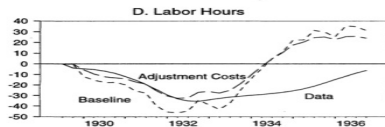
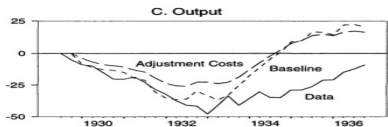
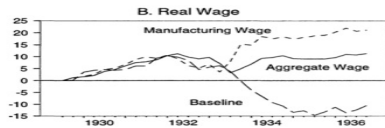
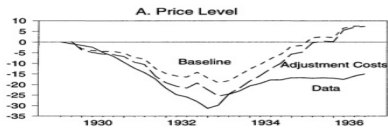
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## Output and Consumption



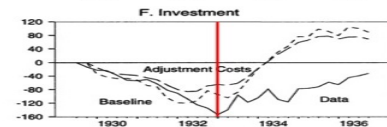
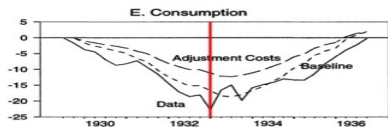
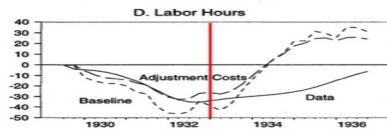
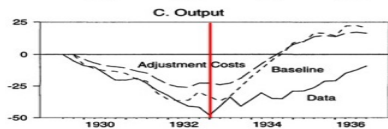
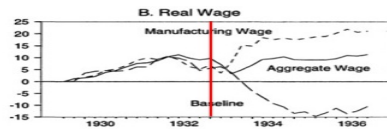
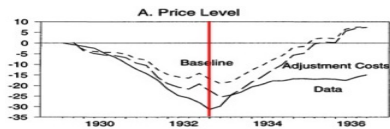
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## Big Picture



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  - Gold Standard, NIRA