Demand-Side View of Financial Frictions
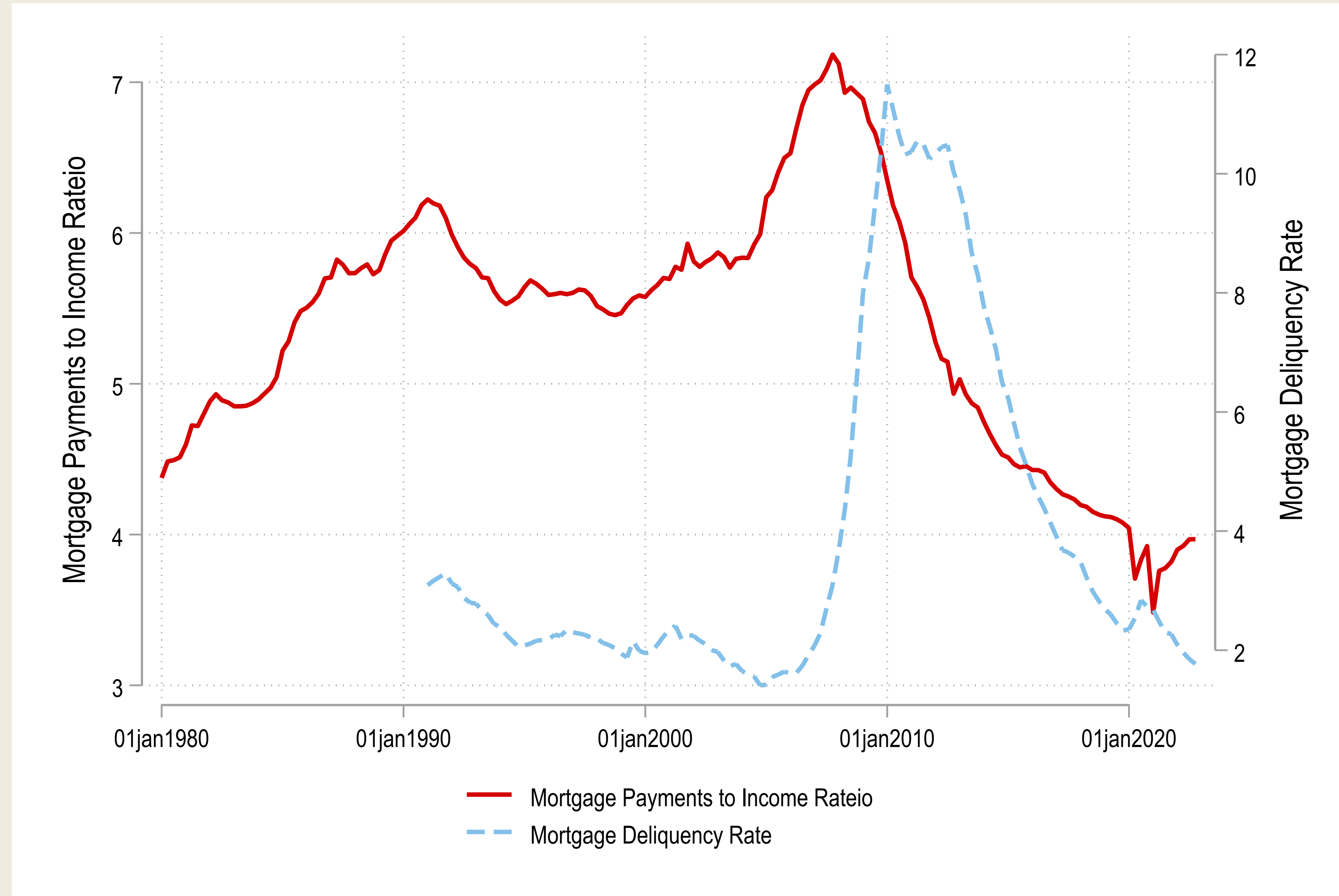
704 Macroeconomic Theory II
Topic 11

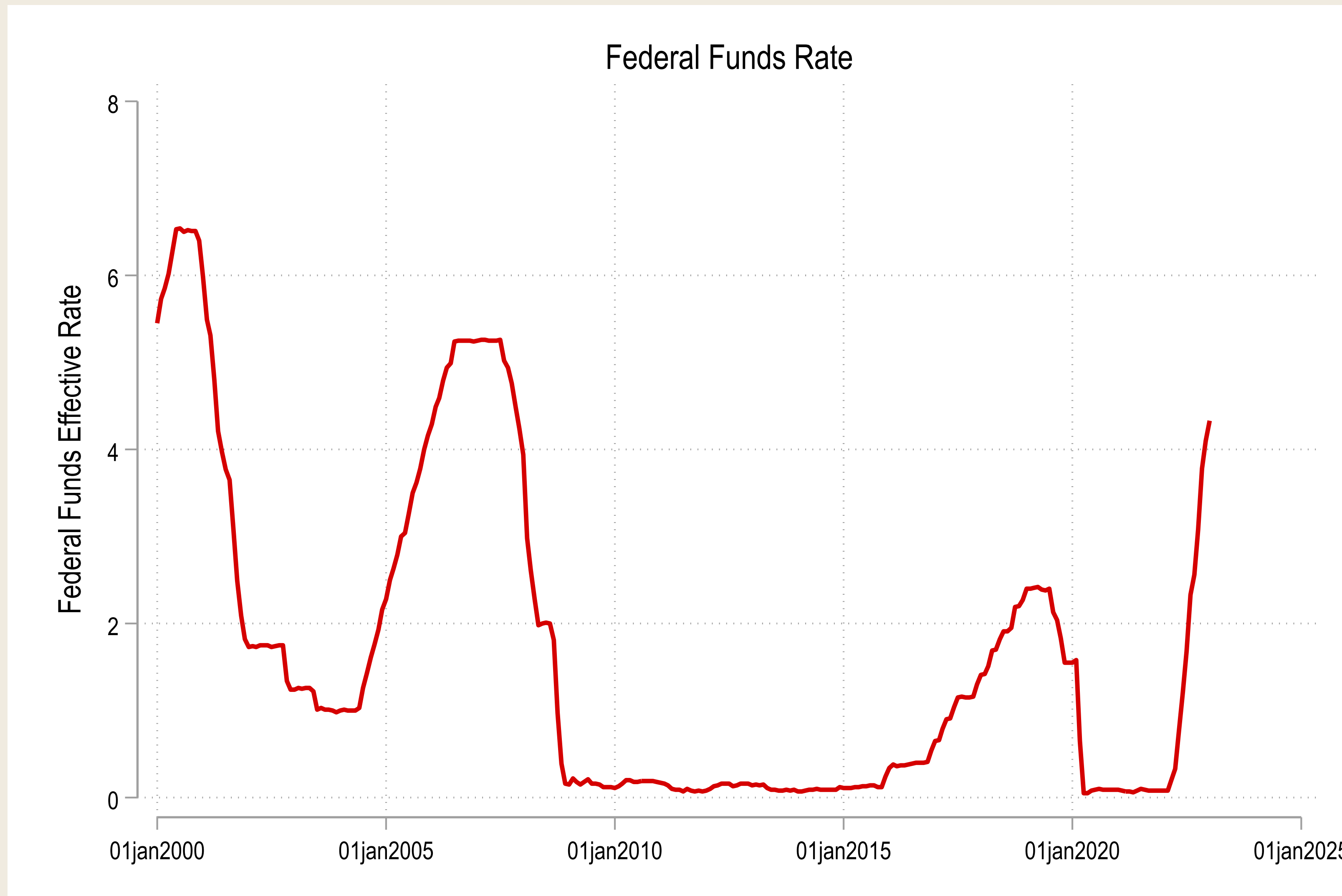Masao Fukui

Household Deleveraging

- So far, we have focused on firm/bank balance sheets

- But...

Binding ZLB During Great Recession

Federal Funds Rate

1. Household Balance Sheet: Deleveraging

High MPC

Low MPC

- Suppose households differ in MPC

- In eqm, high MPC will borrow from low MPC households

- Suppose there's a tightening of borrowing constraint
  - High MPC borrow less, repay more, cut spending
  - Low MPC households receive more repayments

- Redistribution from high to low MPC
  $\Rightarrow$ drop in aggregate demand

- If real rate r can adjust, r falls, and restore agg. demand

- If r cannot fall, drop in output

Household Balance Sheet
Simplified Version of Eggertsson and Krugman (2012)

Households

■ The economy is populated by two types of households (with mass 1/2 for each):

- Patient with discount factor β^h

- Impatient with disocunt factor $\beta^l < \beta^h$

■ Utility function of type i:

$$\sum_{t=0}^{\infty} (\beta^i)^t u(c_t), \quad \text{with} \quad u(c) = \ln c$$

■ Budget constraint:

$$P_t c_t = B_t - (1 + i_{t-1})B_t + w_t l_t, \quad l_t \in [0, \bar{l}]$$

■ Borrowing constraint:

$$(1 + i_t)B_t \leq \phi$$

Nominal Rigidity

■ Assume wages are fully rigid:

$$w_t = \bar{w}$$

■ Final good producers produce with $Y_t = l_t$ and are perfectly competitive:

$$\max_{l_t} P_t l_t - \bar{w} l_t$$

which implies

$$P_t = \bar{w} \equiv 1$$

■ Labor is rationed whenever demand is low:

$$l_t = Y_t$$

- Full employment is $l_t = \bar{l} = Y_t$
- Unemployment if $Y_t \leq \bar{l}$

Equilibrium

- Monetary policy sets nominal interest rate, which equals real rate:

$$(1 + i_t) = (1 + r_t)$$

Recall inflation is zero in this economy, $\pi_t = 0$, for all t.

- The goods market clearing is

$$l_t = Y_t = \frac{1}{2}c_t^h + \frac{1}{2}c_t^l$$

Steady State

- The economy is initially at a flexible price steady state with full employment $l_t = \bar{l}$

- Assume ϕ is low enough so that impatient households borrow up to the limit:
$$c^l = \bar{l} - \phi r / (1 + r)$$

- Patient households' consumption is (since $\bar{l} = \frac{1}{2}c^h + \frac{1}{2}c^l$)
$$c^h = \bar{l} + r\phi / (1 + r)$$

- The interest rate is pinned down by the Euler equation of the patient households:
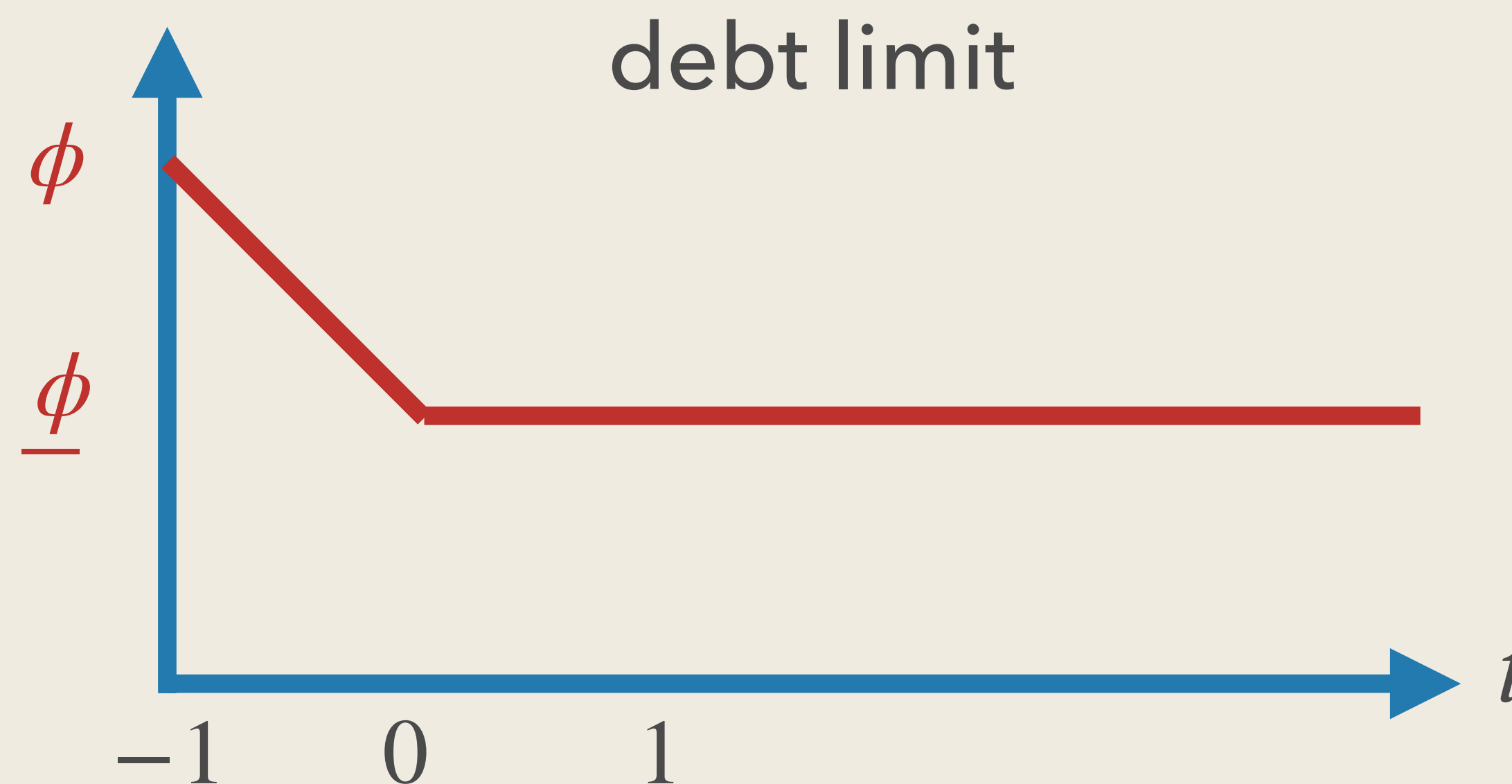$$u'(c^h) = \beta^h (1 + r) u'(c^h)$$

which implies $(1 + r) = 1/\beta^h$

- Note MPC of impatient is 1, MPC of patient is $1 - \beta^h$ (due to log utility)

Deleveraging Shock

- Now consider a deleveraging episode, where ϕ is reduced to $\underline{\phi} < \phi$ at $t = 0$

debt limit

- Assume the economy goes to a new steady state at $t = 1$:
  - $c_t^h = \bar{l} + r\underline{\phi}/(1 + r)$ for $t \geq 1$
  - $c_t^l = \bar{l} - r\underline{\phi}/(1 + r)$ for $t \geq 1$

Equilibrium Given r_0

- Solve for aggregate demand given r_0

- The Euler of patient households implies (with log utility)

$$c_0^h = \frac{1}{\beta^h(1+r_0)}c_1^h = \frac{1}{\beta^h(1+r_0)}(\bar{l} + r\underline{\phi}/(1+r))$$

(1)

- The consumption of impatient is

$$c_0^l = l_0 + \underline{\phi}/(1+r_0) - \phi = Y_0 + \underline{\phi}/(1+r_0) - \phi$$

(2)

Unemployment

- Goods market clearing:

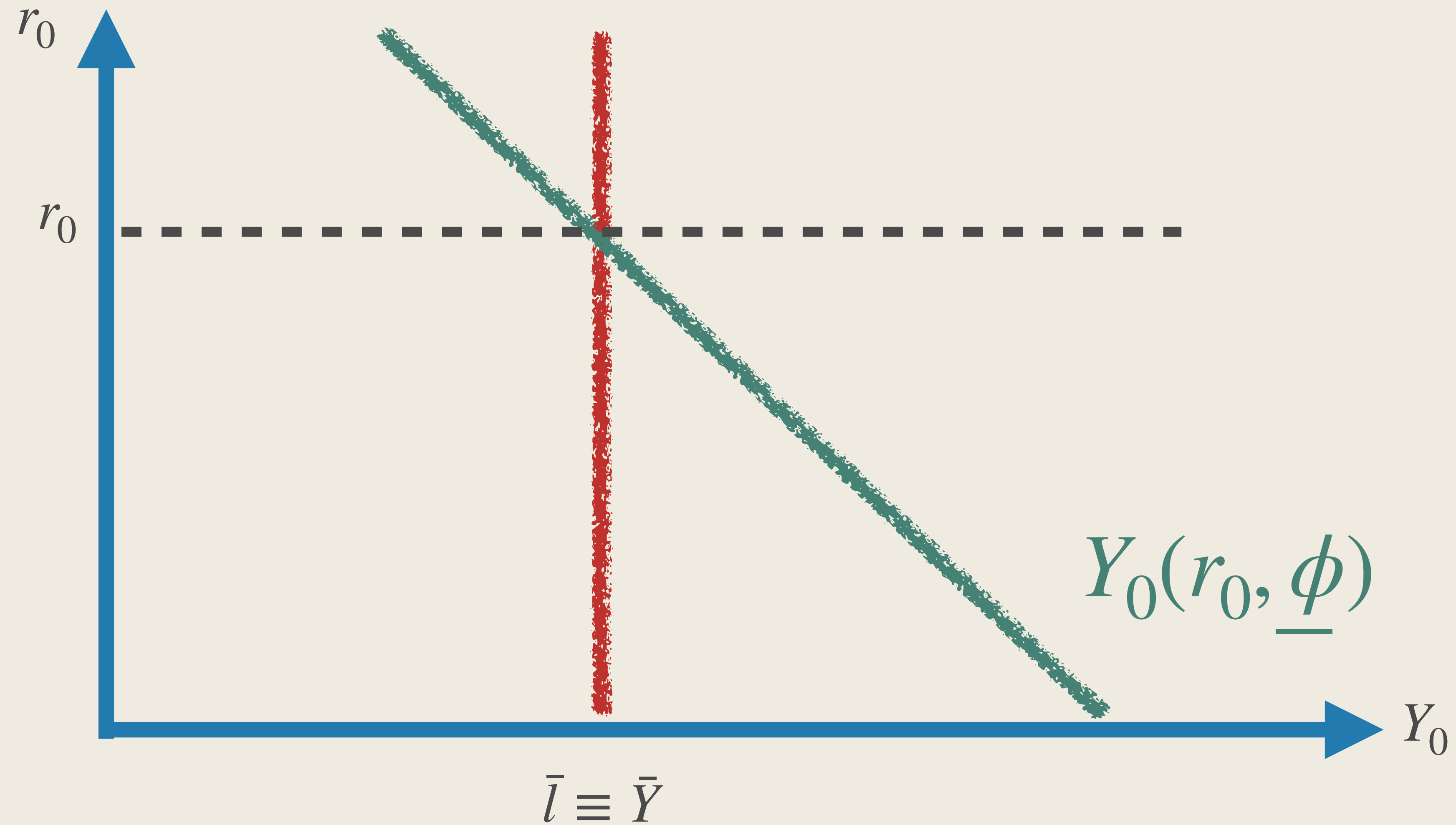$$Y_0 = \frac{1}{2}c_0^h + \frac{1}{2}c_0^l$$

- Pluging (1) and (2), we obtain:

$$Y_0 = \frac{1}{2}\frac{1}{\beta^h(1+r_0)}(\bar{l} + r\underline{\phi}/(1+r)) + \frac{1}{2}\left(Y_0 + \underline{\phi}/(1+r_0) - \phi\right)$$
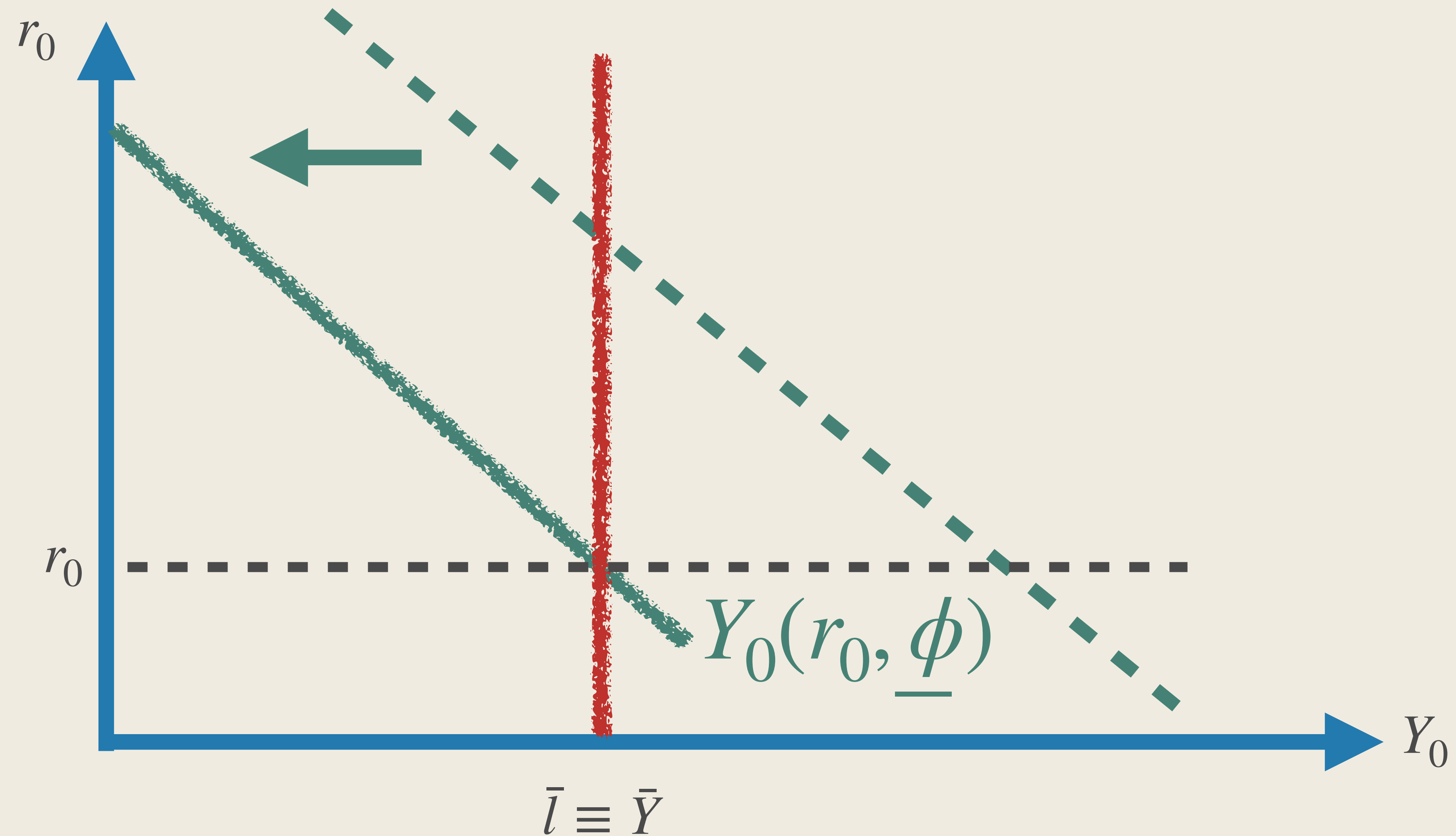
- Solving for Y_0:

$$Y_0 = \frac{1}{\beta^h(1+r_0)}(\bar{l} + r\underline{\phi}/(1+r)) + \left(\underline{\phi}/(1+r_0) - (1+r)\phi\right) \equiv Y(r_0, \underline{\phi})$$

(i) lower debt limit ($\underline{\phi} \downarrow$) lowers output ($Y_0 \downarrow$); (ii) Y_0 is decreasing in r_0
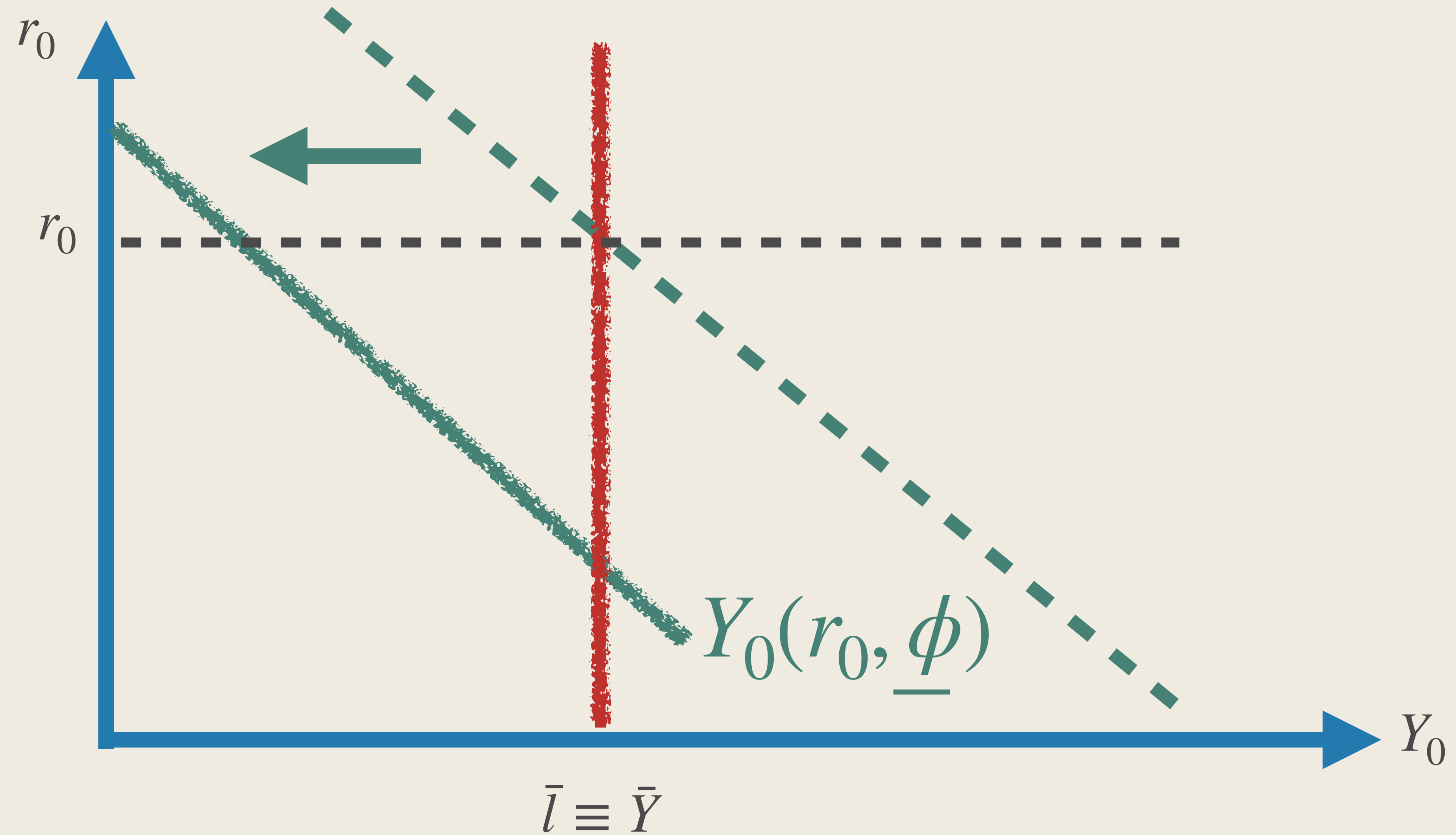
Steady State Equilibrium

Deleveraging Shock with Flexible r_0
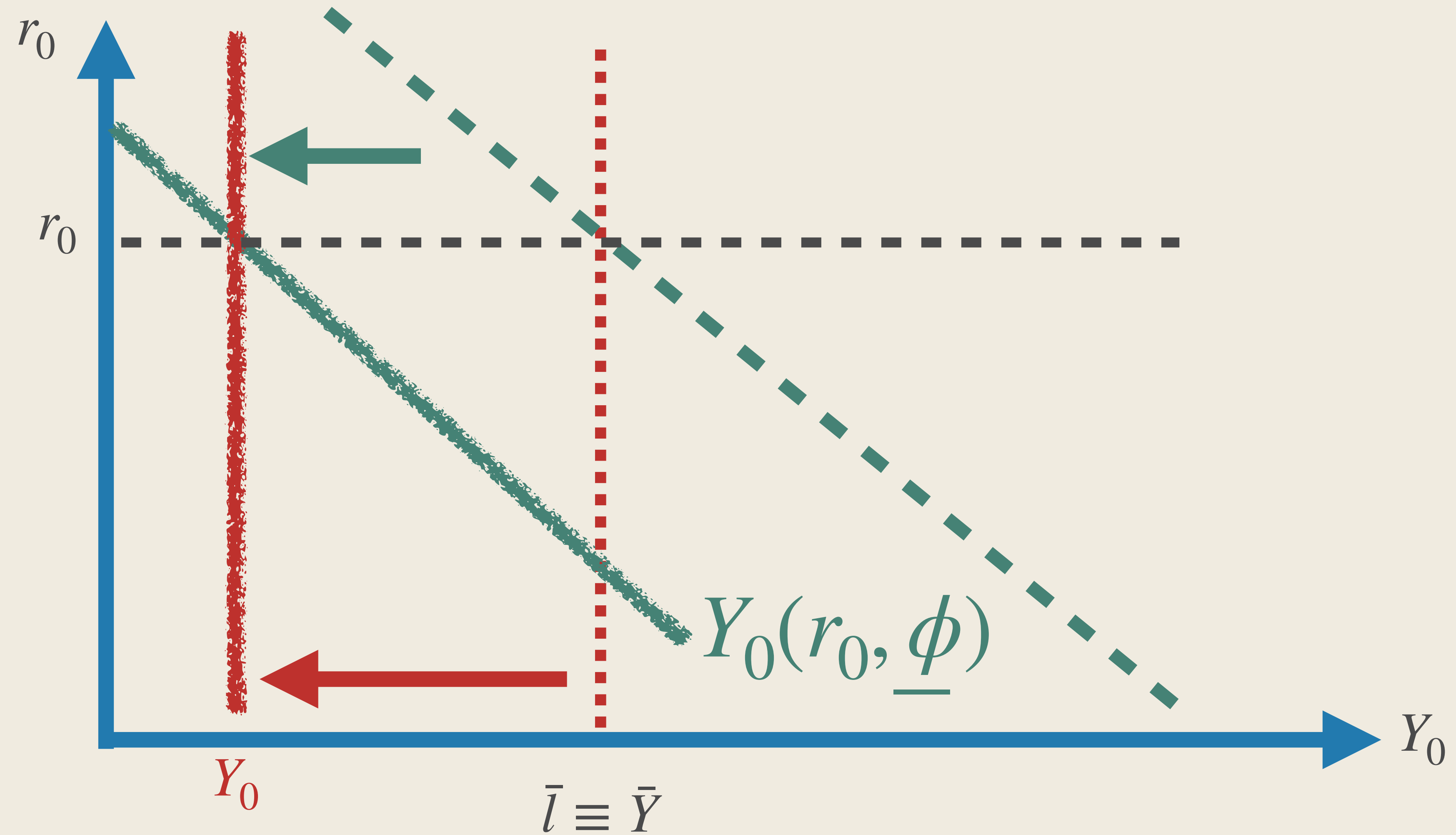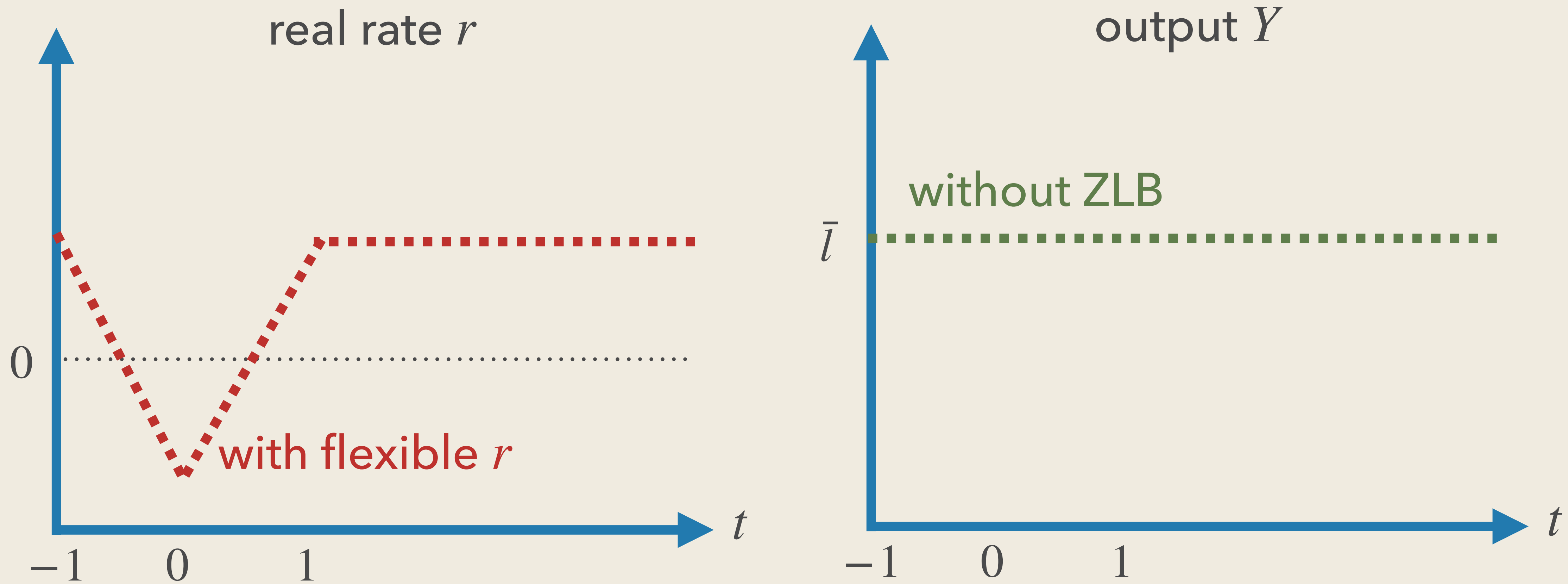
$Y_0(r_0, \underline{\phi})$

r_0

Y_0

$\bar{l} \equiv \bar{Y}$

Equilibrium with Rigid r_0

$Y_0(r_0, \underline{\phi})$

$\bar{l} \equiv \bar{Y}$

Equilibrium with Rigid r_0

r_0

r_0

$Y_0(r_0, \underline{\phi})$

Y_0

$\bar{l} \equiv \bar{Y}$

Y_0

Impulse Response

real rate r — output Y

without ZLB

with flexible r

- At $t = 0$, high MPC (impatient) households are forced to delever

- Transfers from high to low MPC households at $t = 0 \Rightarrow$ lower C_0, lower Y_0

Impulse Response

real rate r

with rigid r

0

with flexible r

t

$-1 \quad 0 \quad 1$

output Y

without ZLB

$\bar{l}$

t

$-1 \quad 0 \quad 1$
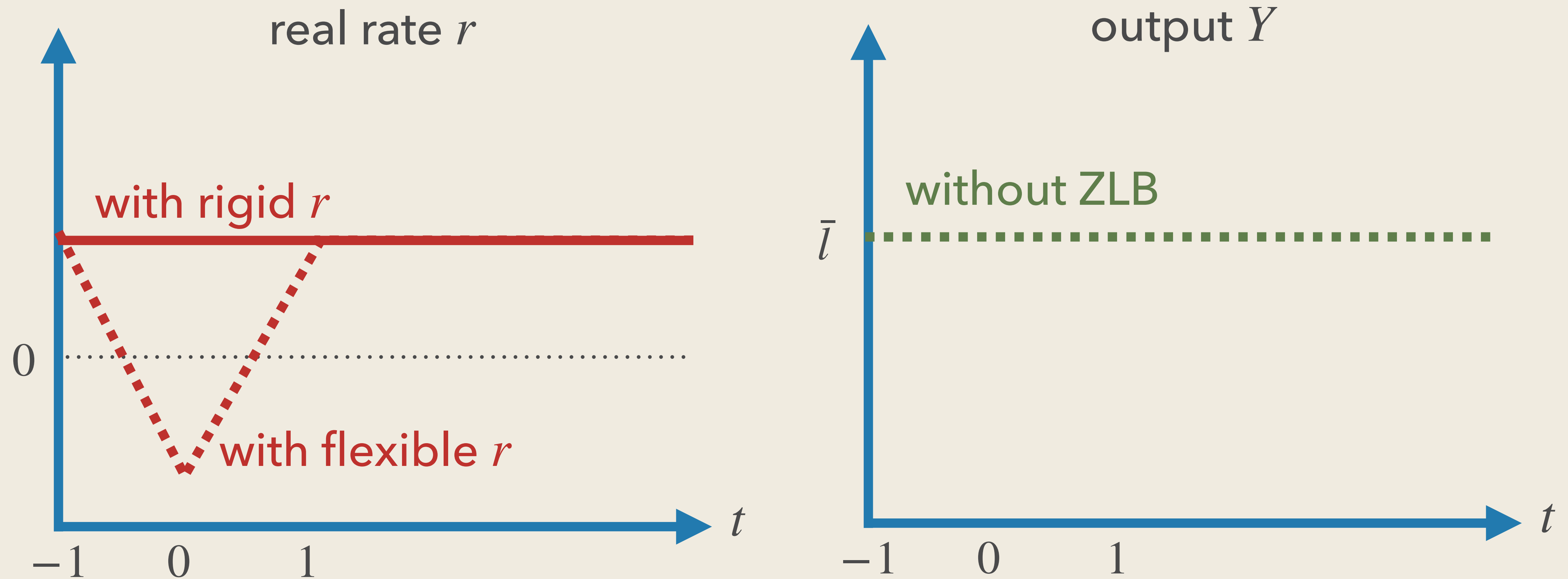
- At $t = 0$, high MPC (impatient) households are forced to delever

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Impulse Response

real rate r

with rigid r

with flexible r

0

-1 0 1

t

output Y

without ZLB

$\bar{l}$

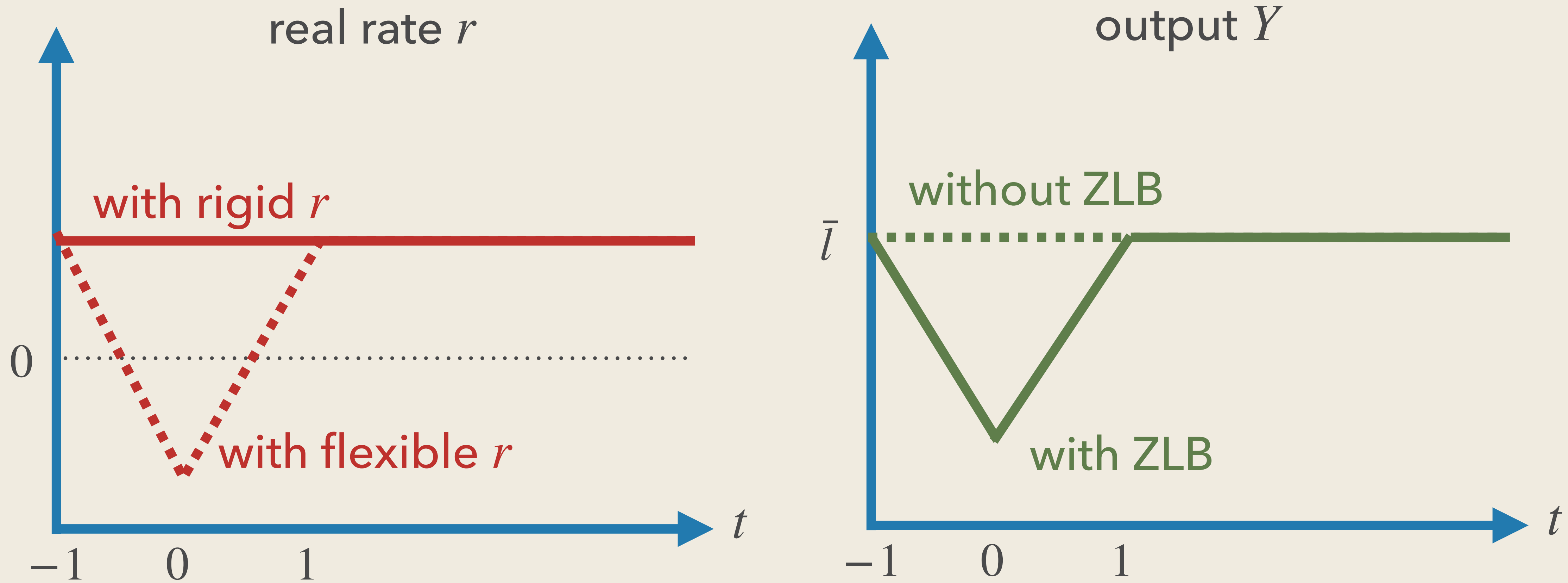with ZLB

-1 0 1

t

- At $t = 0$, high MPC (impatient) households are forced to delever

- Transfers from high to low MPC households at $t = 0 \Rightarrow$ lower C_0, lower Y_0

What Explains the 2007-2009 Drop in Employment?

– Housing Net Worth Channel

Mian and Sufi (2014)

Local Labor Market Approach

■ Did a drop in housing prices cause the 2007-2009 drop in employment?

■ Estimate **county-level** regression in the US 2006-2009:

$$\Delta_{06-09} \ln Emp_c = \beta \Delta_{06-09} \log HP_c + \gamma' \mathbf{X}_c + \epsilon_c$$

■ Focus on two subcomponents of industry employment:

  1. non-tradable industries (e.g., restaurant and retail)
  2. tradable industries

■ Why tradable and non-tradable?

  • If aggregate demand is the driver, should see effect only in non-tradable
  • If the firm balance sheet is the driver, should see effect in both

Example: Rochester vs. Providence
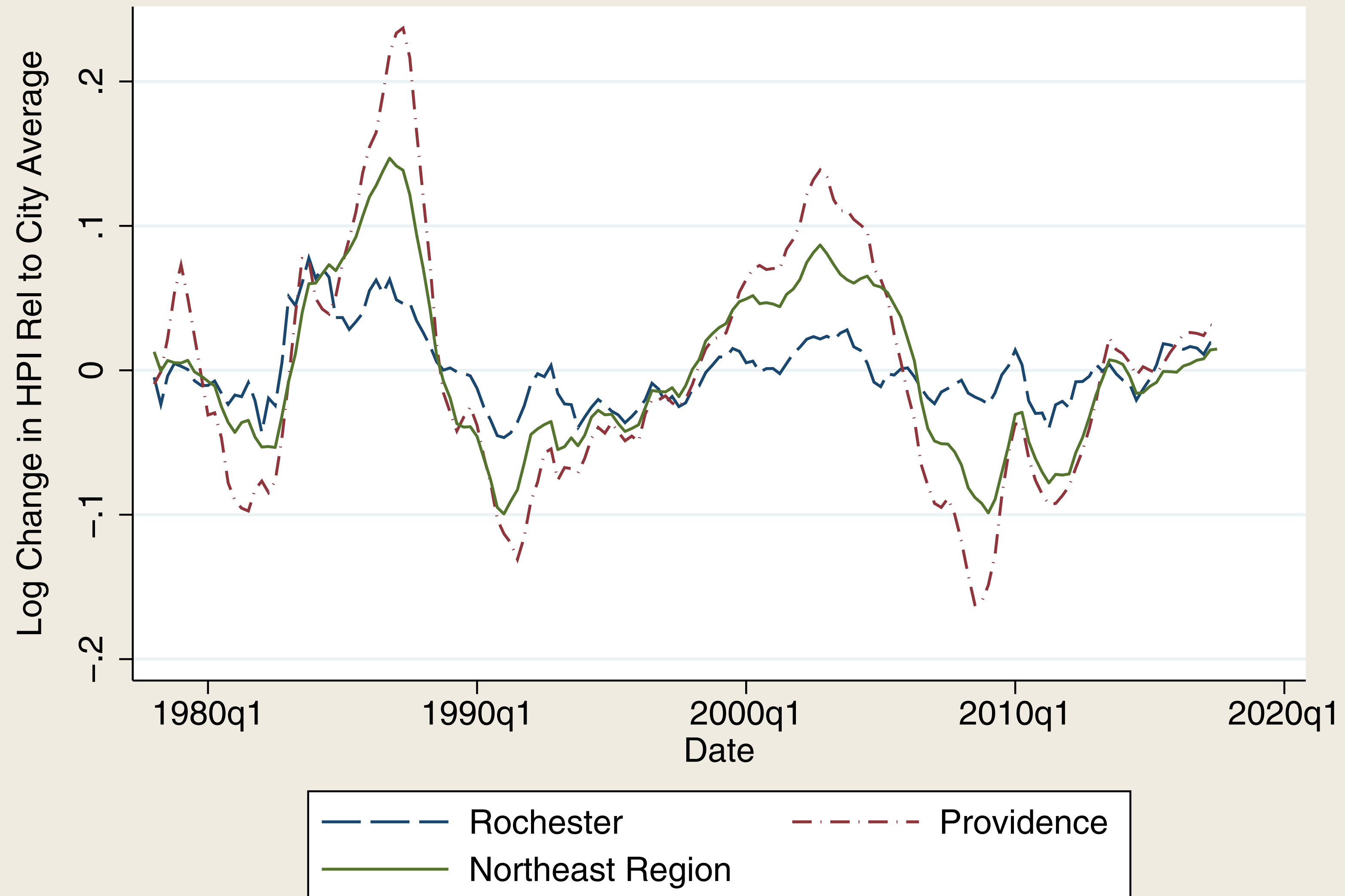
Housing Price and Non-tradable Employment
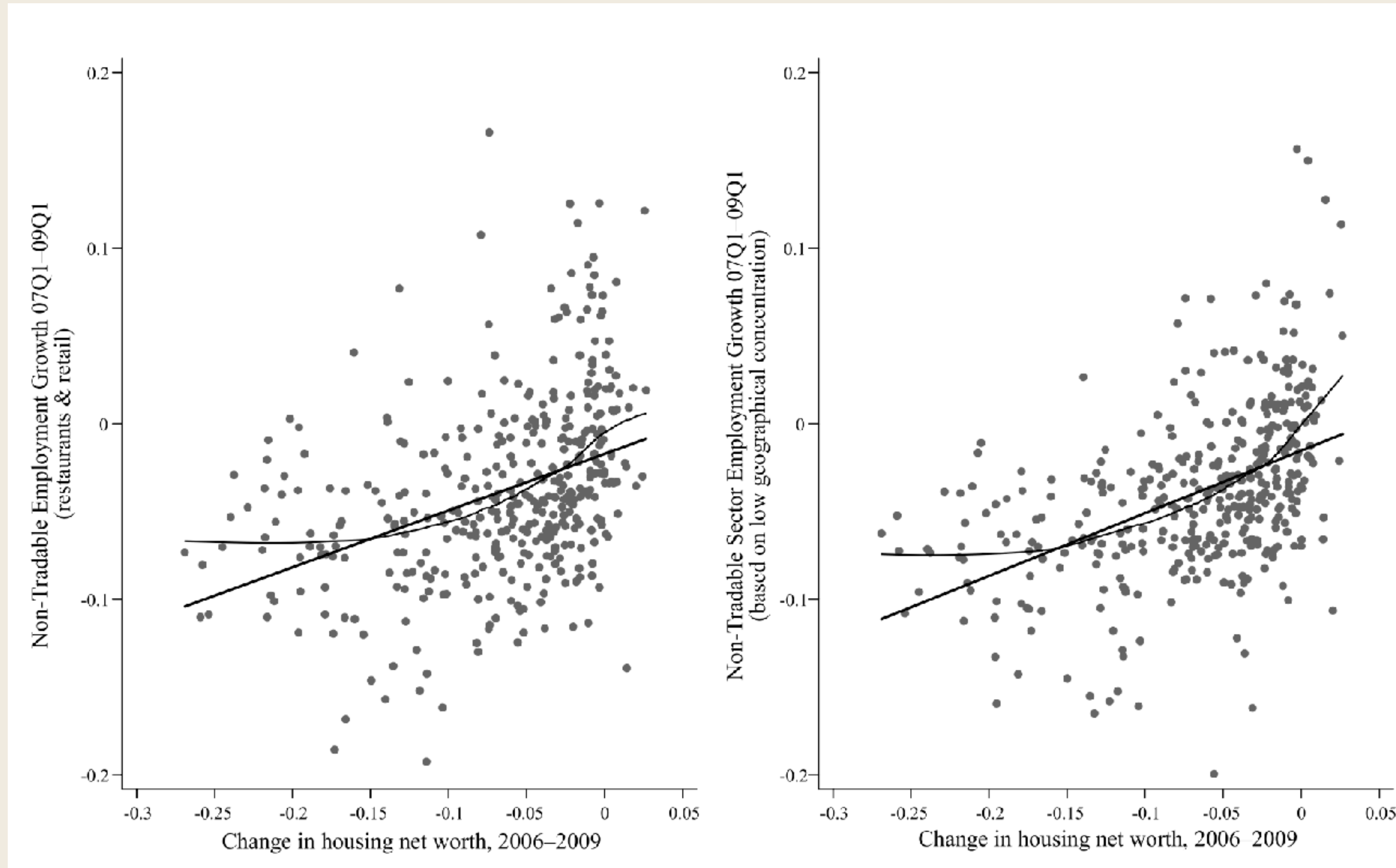
# Identification Threat

■ Concern: there is a shock that affects both HP_c and EMP_c (i.e., $\text{Cov}(\epsilon_c, HP_c) \neq 0$)

　● Industry-specific shocks (e.g., construction)

■ Two approaches:

　1. Control initial industry employment shares
　2. IV: Saiz (2010) housing supply elasticity. More inelastic area saw large ΔHP_c

Housing Wealth and Non-tradable Employment

	Employment Growth, Non-Tradable Industries, 2007–2009									
Non-Tradable Definition Used:	Rest. & Retail (1)	Geog. Concen. (2)	Rest. & Retail (3)	Geog. Concen. (4)	Rest. & Retail (5)	Geog. Concen. (6)	Rest. & Retail (7)	Rest. & Retail (8)	Geog. Concen. (9)	Rest. & Retail (10)
Δ Housing Net Worth, 2006–2009	0.190** (0.042) [0.022]	0.199** (0.049) [0.017]	0.174** (0.043) [0.021]	0.166** (0.046) [0.016]	0.374** (0.132) [0.081]	0.208* (0.086) [0.067]	0.489** (0.127) [0.118]	0.440** (0.140) [0.072]	0.212* (0.091) [0.057]	0.133** (0.036) [0.022]
$\Delta HNW * $ (Construction Share 07)								−1.99* (0.856)	−0.325 (0.561)	
Construction Share 07								−0.082 (0.158)	−0.183 (0.126)	
Δ Construction Employment, 2007–2009										0.079** (0.027)
Constant	−0.022** (0.007)	−0.021** (0.007)	0.176 (0.443)	0.070 (0.286)	0.445 (0.536)	1.233** (0.438)	−0.102 (0.57)	0.254 (0.428)	0.072 (0.290)	0.162 (0.430)
Specification	OLS	OLS	OLS	OLS	IV	IV	IV	OLS	OLS	OLS
Industry controls?			YES	YES	YES	YES	YES	YES	YES	YES
Other controls?							YES			
N	944	944	944	944	540	540	540	944	944	944
R^2	0.096	0.156	0.175	0.236	0.158	0.275	0.144	0.188	0.239	0.194

■ 10 % decline in housing wealth ⇒ a 3.7% decline in non-tradable employment

No Effect on Tradable Industries
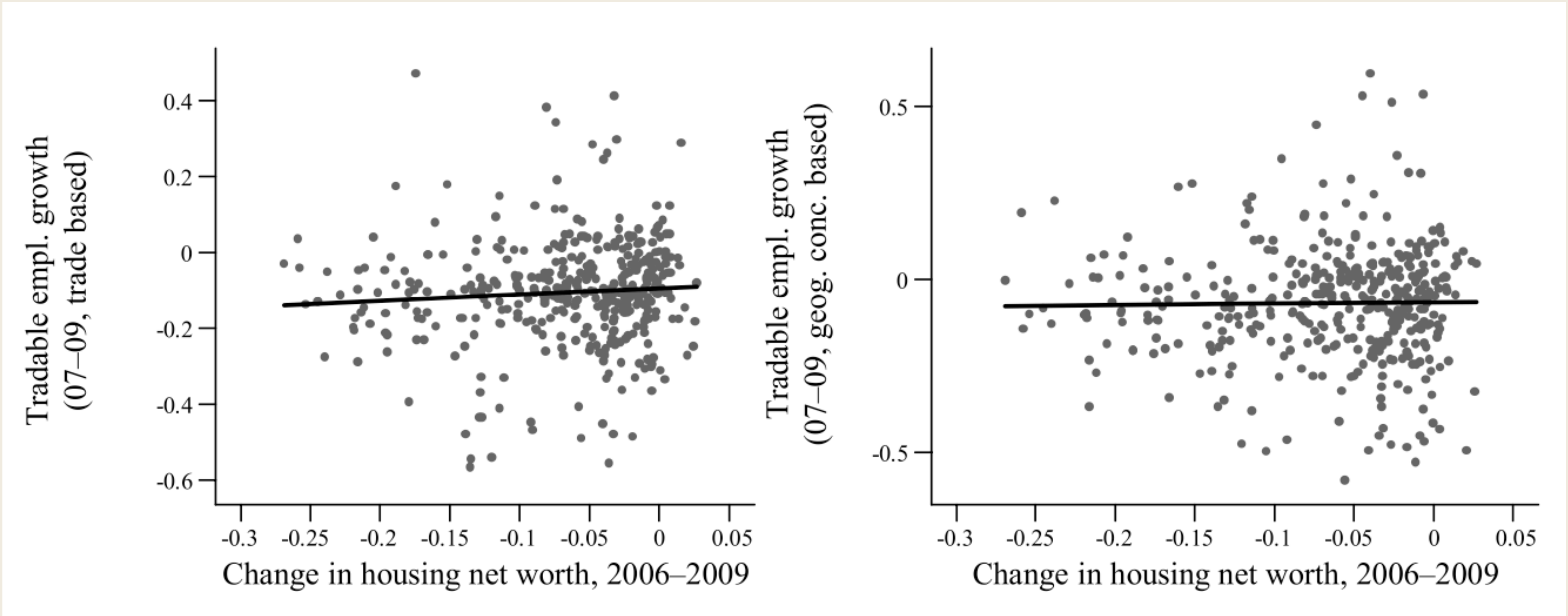
- 10 % decline in housing wealth ⇒ 0.1% decline in tradable employment

Little Adjustment in Wages or Migration

WAGES, MOBILITY, AND THE HOUSING NET WORTH SHOCK[a]

	Total Wage Growth, 2007 to 2009, CBP		Average Hourly Wage Growth, 2007 to 2009, ACS		Population Growth, 2007–2009		In-Migration Growth, 2007–2009	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Δ Housing Net Worth, 2006–2009	0.061	0.078*	0.054	0.056	0.019	0.057**	−0.042	−0.128
	(0.041)	(0.037)	(0.039)	(0.035)	(0.021)	(0.021)	(0.11)	(0.127)
Constant	0.031**	−0.325	0.037**	0.078	0.021**	−0.103	−0.010**	−0.530
	(0.007)	(0.250)	(0.003)	(0.20)	(0.004)	(0.137)	(0.015)	(1.778)
Two-digit 2006 employment share controls?		Yes		Yes		Yes		Yes
N	944	944	943	943	939	939	943	943
R^2	0.012	0.16	0.018	0.076	0.009	0.25	0	0.027

Aggregate Effect

- General equilibrium model calibrated to match cross-sectional estimates

- Around 65% of job loss during 07-09 can be explained by a drop in house prices