A Contagious Malady? Open Economy Dimensions of Secular Stagnation

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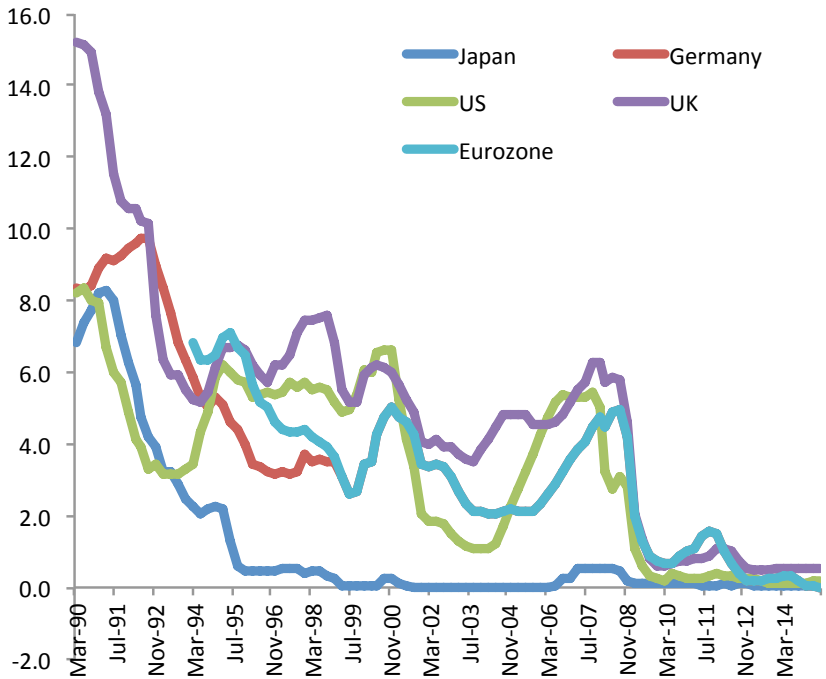
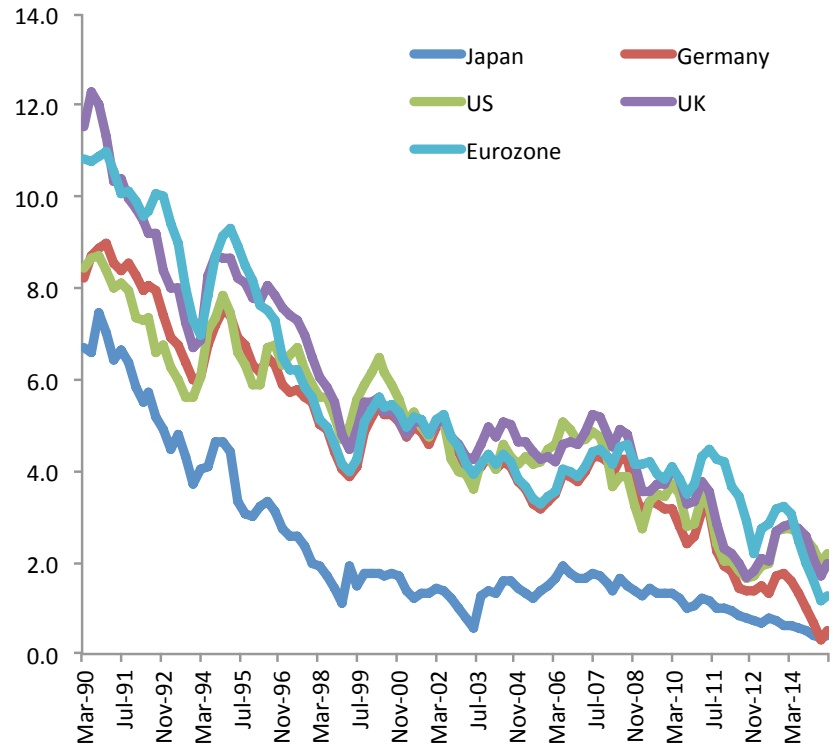
Low Global Interest Rates

Nominal short-term and long-term rates, 1990-2015





Shortcomings of Some Existing Models

Global interest rates:

$$r_{ss} = \frac{1}{\beta} - 1 > 0$$

- Real interest rate must be positive in steady state
- ZLB driven by temporary shocks to discount rate

Output shortfalls and low inflation:

- Persistent global ZLB episodes
- Fall in inflation and poor real GDP growth

Breaking Ricardian equivalence:

- Role of public debt
- Role of income redistribution

US, Eurozone and Japan

Question and Approach

Question

- Does secular stagnation survive in a open economy framework?
- What are the channels by which secular stagnation spreads?
- What are the interactions in policy across countries?

Elements

- Two-country OLG model:
  - World natural rate of interest can be negative
  - Steady state with world interest rate stuck at the zero lower bound
- Permanent slump in output:
  - Downward nominal wage rigidity with partial adjustment
  - Output gaps in steady state across countries

HOUSEHOLDS

Objective function:

$$\max_{C^y, C^m, C^o} U = \left\{ \log\left(C^y\right) + \beta \log\left(C^m\right) + \beta^2 \log\left(C^o\right) \right\}$$

Budget constraints:

$$\begin{aligned} C^y &= B^y \\ C^m &= Y - (1+r)B^y + A^d + A^{int} \\ C^o &= (1+r)A^d + (1+r^*)A^{int} \\ (1+r)B^y &\leq D \\ 0 &\leq A^{int} \end{aligned}$$

Natural Rate under Perfect Integration

Asset market clearing condition:

$$N_t B_t^y + N_t^* B_t^{y*} = N_{t-1} A_t^m + N_{t-1}^* A_t^{m*}$$

Expression for global real interest rate:

$$1 + r_t^W = \frac{1+\beta}{\beta}(1+g_t)\frac{\omega_{t-1} D_t + (1-\omega_{t-1}) D_t^*}{\omega_{t-1}(Y_t - D_{t-1}) + (1-\omega_{t-1})(Y_t^* - D_{t-1}^*)}$$

Determinants of the real interest rate:

- Tighter average (population-weighted) global collateral constraints reduce world real interest rates
- Higher global population growth rates raises world natural rate

Global Savings Glut

Symmetric Population: $\omega = 1/2$

Government budget constraint and fiscal rule:

$$B_t^{g*} + T_t^{o*} + (1 + r_t)\, IR_{t-1} + T_t^{m*} = G_t^* + \left(1 + r_{t-1}^*\right) B_{t-1}^{g*} + IR_t$$

$$T_{t+1}^{o*} = \beta\,(1 + r_t^*)\, T_t^{m*}$$

Asset market clearing ($r = r^*$):

$$B_t^y + B_t^{y*} + B_t^g + B_t^{g*} - IR_t = A_t^d + A_t^{d*}$$

Interest rate ($r = r^*$):

$$1 + r_t = \frac{D_t + D_t^*}{A_t^m - B_t^g + A_t^{m*} - B_t^{g*} + IR_t}$$

Inflation Target and Negative Natural Rates

ZLB places a bound on steady state inflation:

$$\bar{\Pi} \geq \frac{1}{1+r}$$
$$\bar{\Pi}^* \geq \frac{1}{1+r^*}$$

- If the natural rate of interest is negative, steady state inflation must be positive
- No equilibrium with stable inflation
- But what happens with nominal rigidities and zero inflation target?

Aggregate Supply

Output and labor demand:

$$Y_t = L_t^{\alpha}$$
$$\frac{W_t}{P_t} = \alpha L_t^{\alpha-1}$$

Labor supply:

- Middle-generation households supply a constant level of labor $\bar{L}$
- Implies a constant market clearing real wage $\bar{W} = \alpha \bar{L}^{\alpha-1}$
- Implies a constant full-employment level of output: $Y_{fe} = \bar{L}^{\alpha}$

Downward Nominal Wage Rigidity

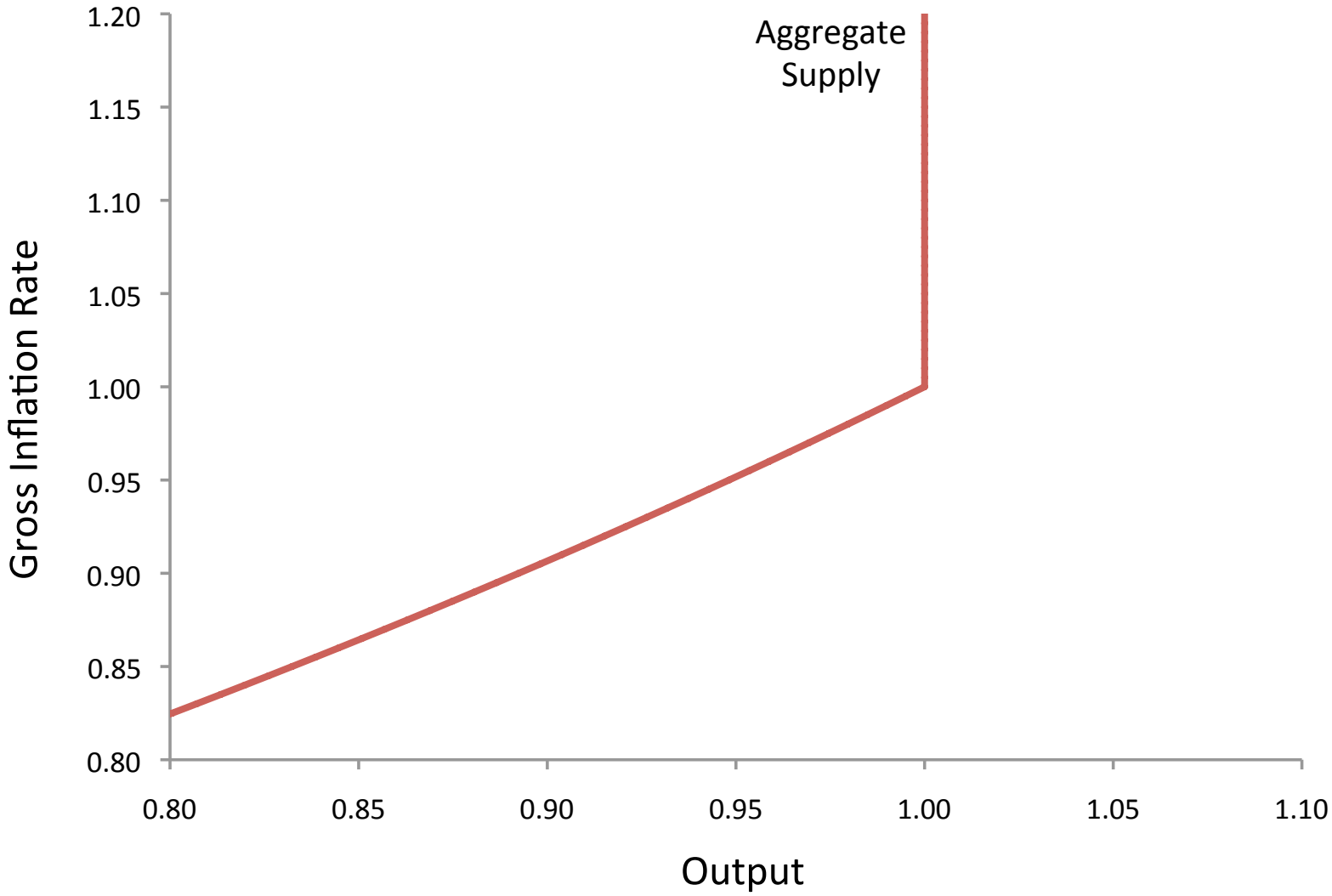
Partial wage adjustment:

$$W_t = \max\left\{\tilde{W}_t, P_t \alpha \bar{L}^{\alpha-1}\right\}$$
$$\text{where } \tilde{W}_t = \gamma W_{t-1} \bar{\Pi} + (1-\gamma) P_t \alpha \bar{L}^{\alpha-1}$$

Wage rigidity and unemployment:

- $\tilde{W}_t$ is a wage norm
- If real wages exceed market clearing level, employment is rationed
- Unemployment: $U_t = \bar{L} - L_t$

Aggregate Supply Relation



Monetary Policy

Inflation targeting:

$$\Pi_t = \bar{\Pi} \text{ if } i > 0$$
$$\Pi_t^* = \bar{\Pi}^* \text{ if } i^* > 0$$

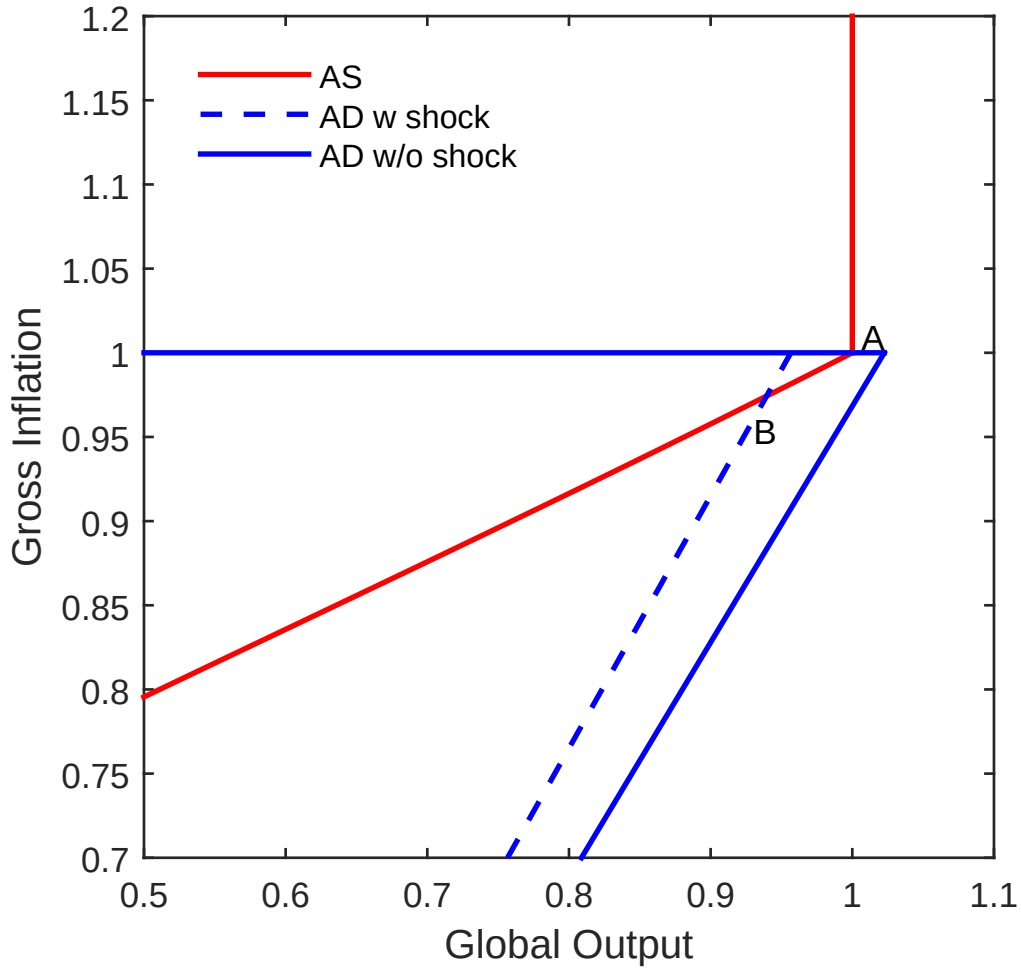
Above the ZLB:

- If $r_t > \bar{\Pi}^{-1}$, nominal rate equals the natural rate
- Otherwise, zero lower bound must be binding: $i = 0$

Derivation of aggregate demand curve:

$$1 + r_{t+1} = \frac{1 + i_t}{\Pi_{t+1}}$$
$$1 + r_t^W = \frac{1+\beta}{\beta}(1+g_t)\frac{\omega_{t-1}D_t + (1-\omega_{t-1})D_t^*}{\omega_{t-1}(Y_t - D_{t-1}) + (1-\omega_{t-1})(Y_t^* - D_{t-1}^*)}$$

World Output and Inflation



Properties of a Symmetric Stagnation

Proposition 1

Let $1 + r^{W,nat} < \bar{\Pi}^{-1}$ *and* $\gamma, \gamma^* > 0$. *Then, there exists a locally determinate symmetric stagnation equilibrium with* $Y < Y_{fe}$, $Y^* < Y^*_{fe}$, *and* $\Pi < \bar{\Pi}$.

Characterization:

- Steady state with nominal interest rate at ZLB
- Inflation below target in steady state - possibly outright deflation
- Business cycle fluctuations around this depressed steady state

Quantitative Example: Eurozone and US

Calibration

Panel A: Common parameters	*Symbol*	*Value*	
Labor share	α	0.7	
Discount rate	β	0.96	
Inflation target	$\bar{\Pi}$	1.75%	
Population growth	g	1%	
Panel B: Country-specific parameters	*Symbol*	*US*	*Eurozone*
Potential output	Y_{fe}, Y^*_{fe}	1	0.96
Wage adjustment	γ, γ^*	0.926	0.941
Collateral constraint	D, D^*	0.157	0.136

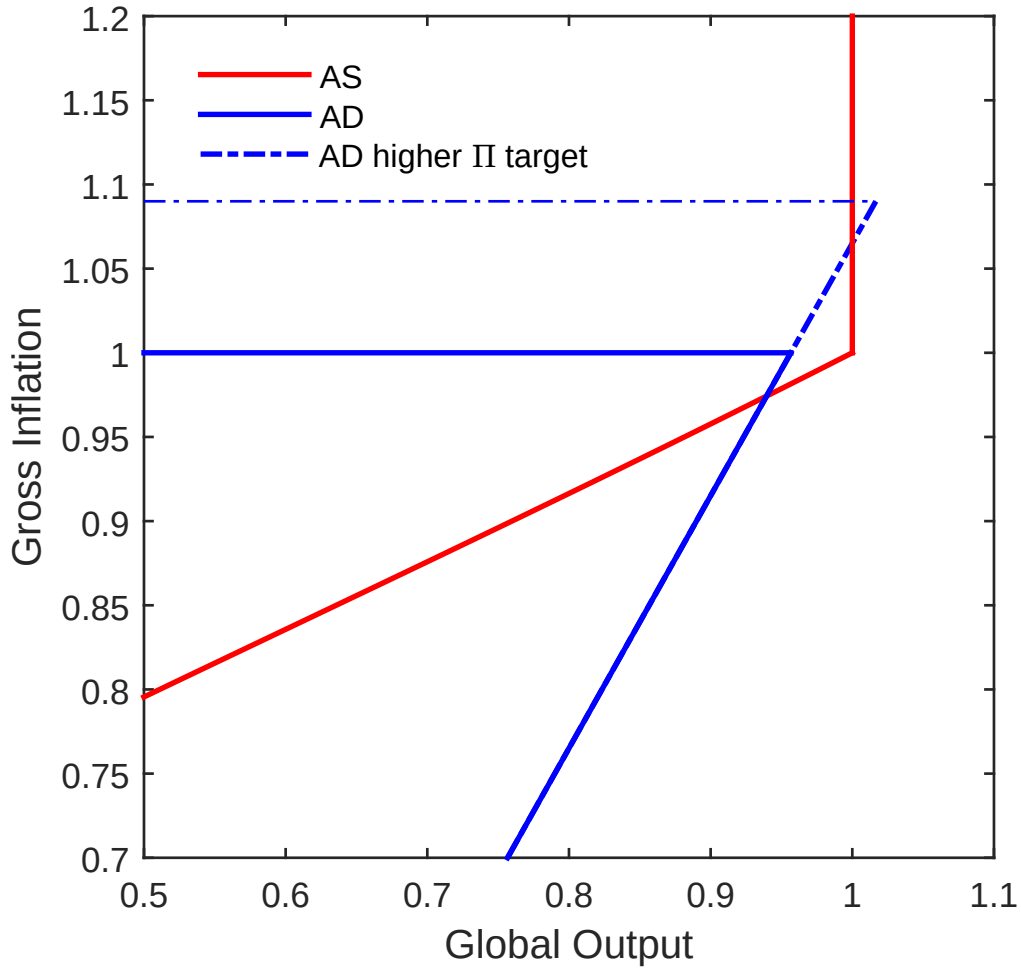
Quantitative Example: Eurozone and US

Key Aggregates

Panel C: Baseline calibration	*Symbol*	*US*	*Eurozone*
Output gap	Y, Y^*	10%	15%
Nominal rate	i, i^*	0%	0%
Inflation rate	Π, Π^*	1%	1%
Net foreign asset position	$B^m - \frac{1+g}{1+r}D$	−12%	12.6%

Panel D: Counterfactual under autarky	*Symbol*	*US*	*Eurozone*
Output gap	Y, Y^*	0%	21.3%
Nominal rate	i, i^*	0.25%	0%
Welfare (rel. to integration)	U, U^*	+7.5%	−4.2%

Raising the Inflation Target



Government Purchases

Balanced budget government purchases:

$$1+r=(1+g)\,\frac{1+\beta}{\beta}\,\frac{\omega D+(1-\omega)\,D^{*}}{\omega\,(Y-D)+(1-\omega)\,(Y^{*}-D^{*})-\omega G-(1-\omega)\,G^{*}}$$

Implications of fiscal expansion:

- Increase in global average government purchases increases world rate
- Role for coordinated fiscal expansion since benefits are shared across countries
- Absent coordination, fiscal expansion would be undersupplied
- Coordination problem worsens with number of countries

Permanent Increase in the Public Debt

Interest rate with domestic and foreign public debt:

$$1+r=\frac{(1+g)\,\frac{1+\beta}{\beta}\,(\omega D+(1-\omega)\,D^{*})}{\omega\,(Y-D)+(1-\omega)\,(Y^{*}-D^{*})-\frac{1+\beta}{\beta}\,(\omega B^{g}+(1-\omega)\,B^{g*})}$$

Implications of fiscal expansion:

- Under perfect integration, what matters is global average of public debt
- Decline in public debt in Eurozone lowers world natural rate of interest
- Similar to government purchases, public debt expansion would be undersupplied

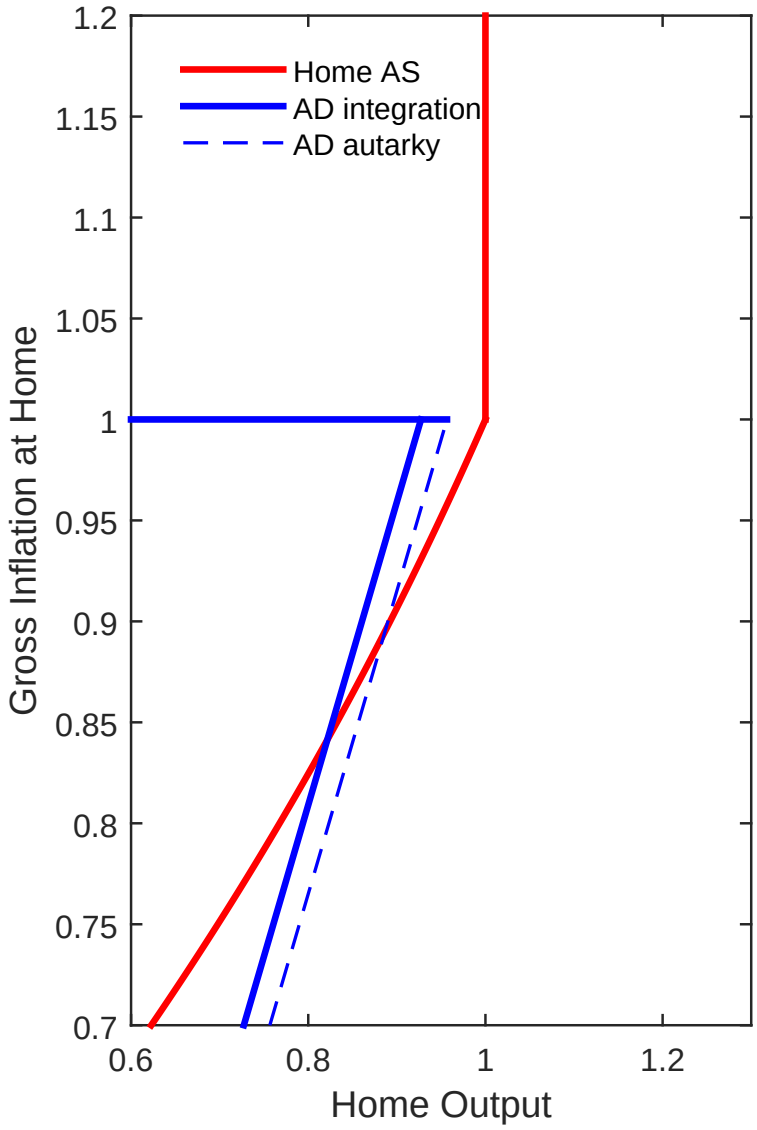
Quantitative Example: Eurozone and US

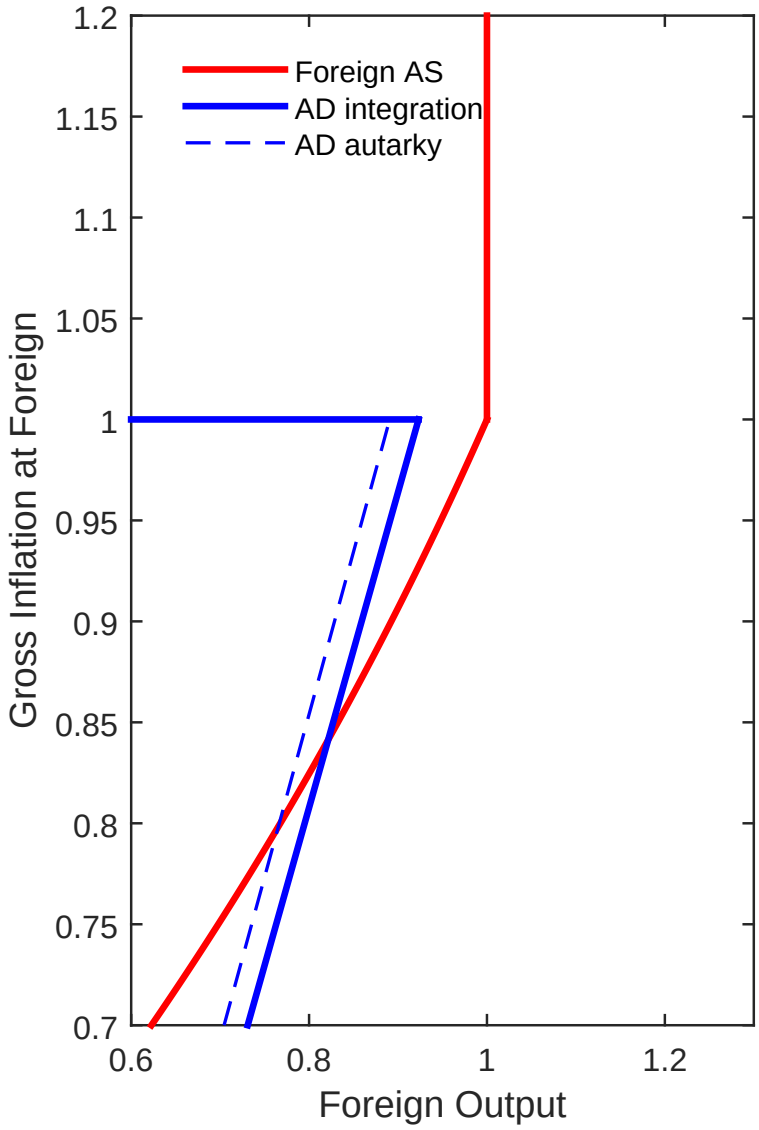
Fiscal Multipliers

Symmetric increase in $G = 0.5\%$	*Symbol*	*US*	*Eurozone*
Output gap	Y, Y^*	7.1%	10.7%
Nominal rate	i, i^*	0%	0%
Inflation rate	Π, Π^*	1.2%	1.2%
Net foreign asset position	$B^m - \frac{1+g}{1+r} D$	-17.3%	18.0%

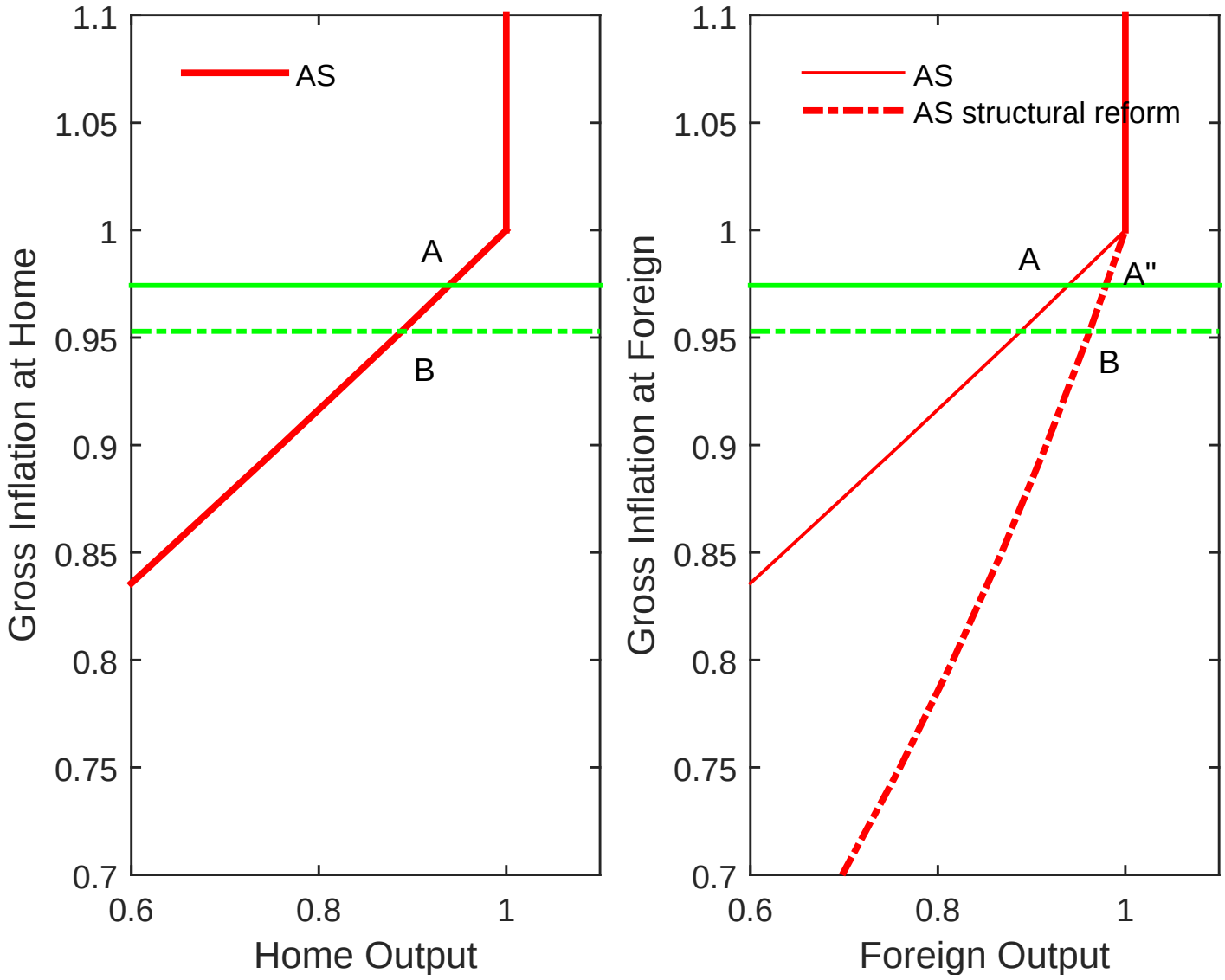
Asymmetric increase in $G = 1\%$	*Symbol*	*US*	*Eurozone*
Output gap	Y, Y^*	7.1%	10.7%
Net foreign asset position	$B^m - \frac{1+g}{1+r} D$	-20.2%	21.1%
Welfare (rel. to symmetric)	U, U^*	-0.2%	$+0.2\%$

Neomercantilism and Foreign Asset Targets

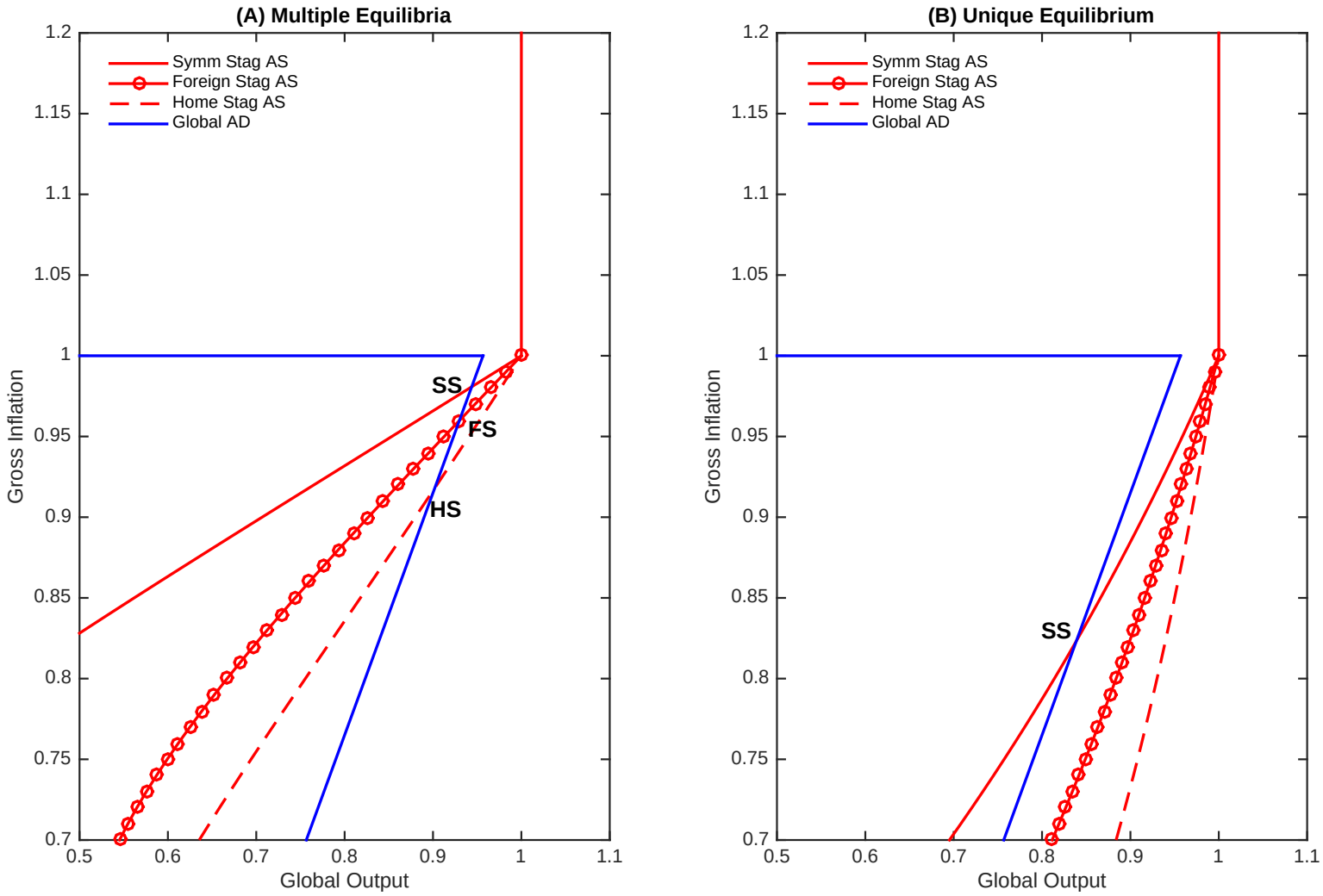




Effects of Structural Reform



Multiple Equilibria under Perfect Integration



Currency Wars

Nominal exchange rate:

$$S_t = \frac{P_t^*}{P_t}$$

$$\Delta S_t = \frac{\Pi_t^*}{\Pi_t}$$

Exchange rate policy when $r^{w,Nat} < 0$:

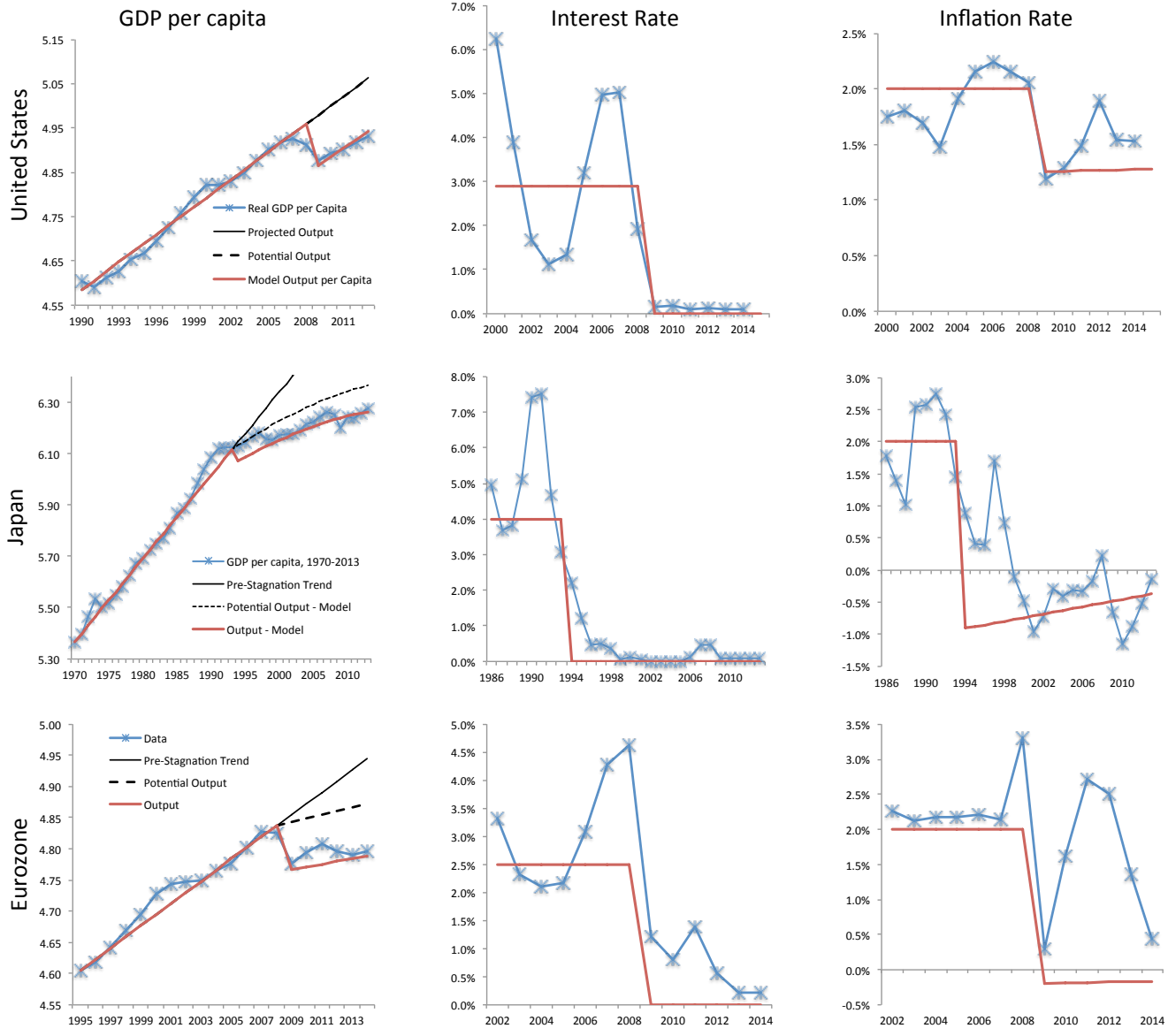
- A pegged exchange rate $S_t = \bar{S}$ eliminates any asymmetric stagnation equilibrium
- Benefits the nation in stagnation at the expense of the nation not in stagnation
- Sufficiently aggressive depreciation eliminates the symmetric stagnation as equilibrium

Conclusions for Policy

1. Importance of a policy response
   - ZLB can persist for arbitrarily long periods
2. Importance of fiscal policy coordination
   - Fiscal expansions will tend to be undersupplied
   - Fiscal austerity will tend to be oversupplied
3. Risks of beggar-thy-neighbor policies
   - Exchange rate policies may alleviate stagnation in one country while worsening in the other
   - Structural reform and targeting trade surplus similar effects
4. Fiscal policy focused on diminishing oversupply of saving

Additional Slides

Secular Stagnation Episodes



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