Unemployment, the Output Gap and the Welfare Costs of Fluctuations

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Two Views about Economic Fluctuations

- "Keynesian"

  - ugly face of capitalism
  - recessions as periods in which the economy operates below the *efficient* level of activity and resource utilization.
  - calls for stabilization policies

- "RBC"

  - cyclical fluctuations as the economy's efficient response to a variety of exogenous disturbances
  - stabilization policies likely to be counterproductive

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- Challenge: unobservability of the *efficient* level of output and, hence, of the *output gap*.

What I Do

- A new measure of the *output gap* consistent with a broad class of macro models
- Underlying framework: deviations from efficient output are the result of

  - market power by firms and workers
  - variations in average wage and price markups (e.g. due to nominal rigidities)

- Implications for welfare
- Evidence based on quarterly data for the U.S. and the Euro area

Preliminaries: the Average Price Markup

- Technology

$$Y_t = A_t N_t^{1-\alpha}$$

- Marginal Product of Labor

$$MPN_t = (1-\alpha)\left(\frac{Y_t}{N_t}\right)$$

- Average nominal marginal cost

$$\Psi_t = \frac{W_t}{MPN_t} = \frac{W_t}{(1-\alpha)(Y_t/N_t)}$$

- Average price markup

$$\mathcal{M}_t^p \equiv \frac{P_t}{\Psi_t} = \frac{(1-\alpha)(Y_t/N_t)}{W_t/P_t}$$

Preliminaries: the Average Wage Markup

- Preferences (large household)

$$U(C_t, N_t) = \log C_t - \chi_t \frac{N_t^{1+\varphi}}{1+\varphi}$$

- Marginal rate of substitution

$$\begin{aligned} MRS_t &= -\frac{U_{n,t}}{U_{c,t}} \\ &= \chi_t C_t N_t^{\varphi} \end{aligned}$$

- Average wage markup

$$\mathcal{M}_t^w \equiv \frac{W_t / P_t}{MRS_t} = \frac{W_t / P_t}{\chi_t C_t N_t^{\varphi}}$$

Equilibrium

- Goods market clearing

$$Y_t = C_t$$

- Equilibrium employment and output:

$$N_t = \left(\frac{1-\alpha}{\mathcal{M}_t \chi_t}\right)^{\frac{1}{1+\varphi}} \quad ; \quad Y_t = A_t \left(\frac{1-\alpha}{\mathcal{M}_t \chi_t}\right)^{\frac{1-\alpha}{1+\varphi}}$$

where $\mathcal{M}_t \equiv \mathcal{M}_t^p \mathcal{M}_t^w \geq 1$ is a *composite markup*.

- *Efficient* employment and output: $\mathcal{M}_t = 1$, for all t

$$N_t^e = \left(\frac{1-\alpha}{\chi_t}\right)^{\frac{1}{1+\varphi}} \quad ; \quad Y_t^e = A_t \left(\frac{1-\alpha}{\chi_t}\right)^{\frac{1-\alpha}{1+\varphi}}$$

- Output gap

$$x_t \equiv y_t - y_t^e = -\left(\frac{1-\alpha}{1+\varphi}\right)(\mu_t^p + \mu_t^w)$$

where $\mu_t^p \equiv \log \mathcal{M}_t^p$ and $\mu_t^w \equiv \log \mathcal{M}_t^w$

Measuring the Price Markup

- Following Rotemberg and Woodford (1999)

$$\mathcal{M}_t^p = \frac{(1-\alpha)(Y_t/N_t)}{W_t/P_t} = \frac{1-\alpha}{S_t}$$

where $S_t \equiv \frac{W_t N_t}{P_t Y_t}$ is the *labor income share*. Accordingly:

$$\mu_t^p = -s_t + \log(1-\alpha)$$

Measuring the Wage Markup

- Labor supply

$$\frac{W_t}{P_t} = \chi_t C_t L_t^{\varphi}$$

$$w_t - p_t = c_t + \varphi l_t + \xi_t$$

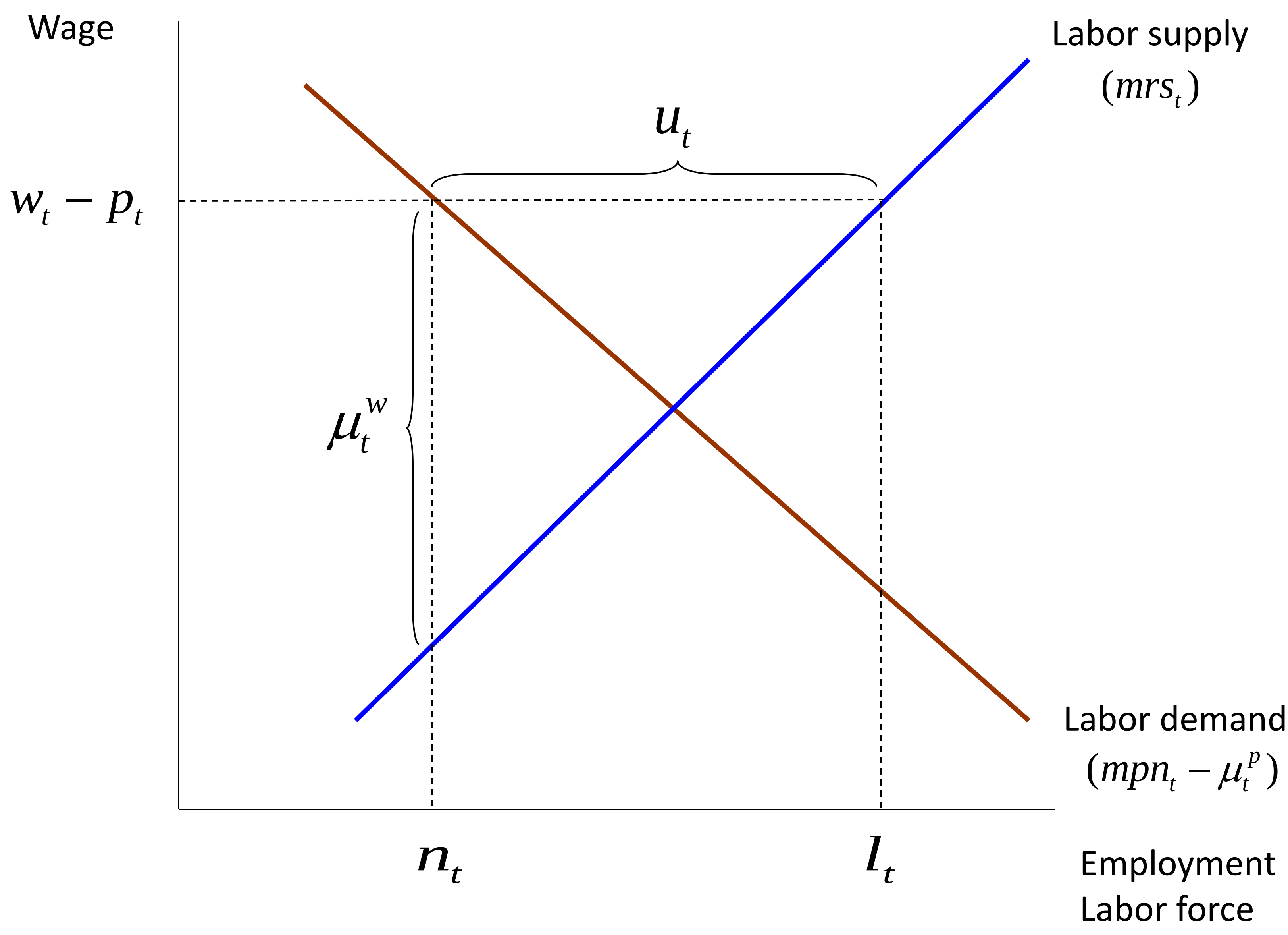
- Unemployment rate

$$u_t \equiv l_t - n_t$$

- Relation between average wage markup and unemployment rate:

$$\begin{aligned}
\mu_t^w &= (w_t - p_t) - (c_t + \varphi n_t + \xi_t) \\
&= (w_t - p_t) - (c_t + \varphi l_t + \xi_t) + \varphi(l_t - n_t) \\
&= \varphi u_t
\end{aligned}$$

Figure 1.1: The Wage Markup and the Unemployment Rate



Measuring the Output Gap

- Proposed Output Gap Measure

$$
\begin{aligned}
x_t &\equiv y_t - y_t^e \\
&= -\left(\frac{1-\alpha}{1+\varphi}\right)(\mu_t^p + \mu_t^w) \\
&= \left(\frac{1-\alpha}{1+\varphi}\right)(s_t - \varphi u_t - \log(1-\alpha))
\end{aligned}
$$

- Calibration

Technology: $\alpha = 0.25$

- consistent with $\mathcal{M}^p = 1.2$, given $\alpha = 1 - S\mathcal{M}^p$ and $S = 0.62$
- alternative: $\alpha = 0.38$ (maximum consistent with non-negative markup)

Preferences: $\varphi = 5$

- implied Frisch labor supply elasticity: 0.2
- alternatives: $\varphi = 1$ (high elasticity) and $\varphi = 10$ (low elasticity)

- Evidence

Figure 2.1 : The U.S. Output Gap

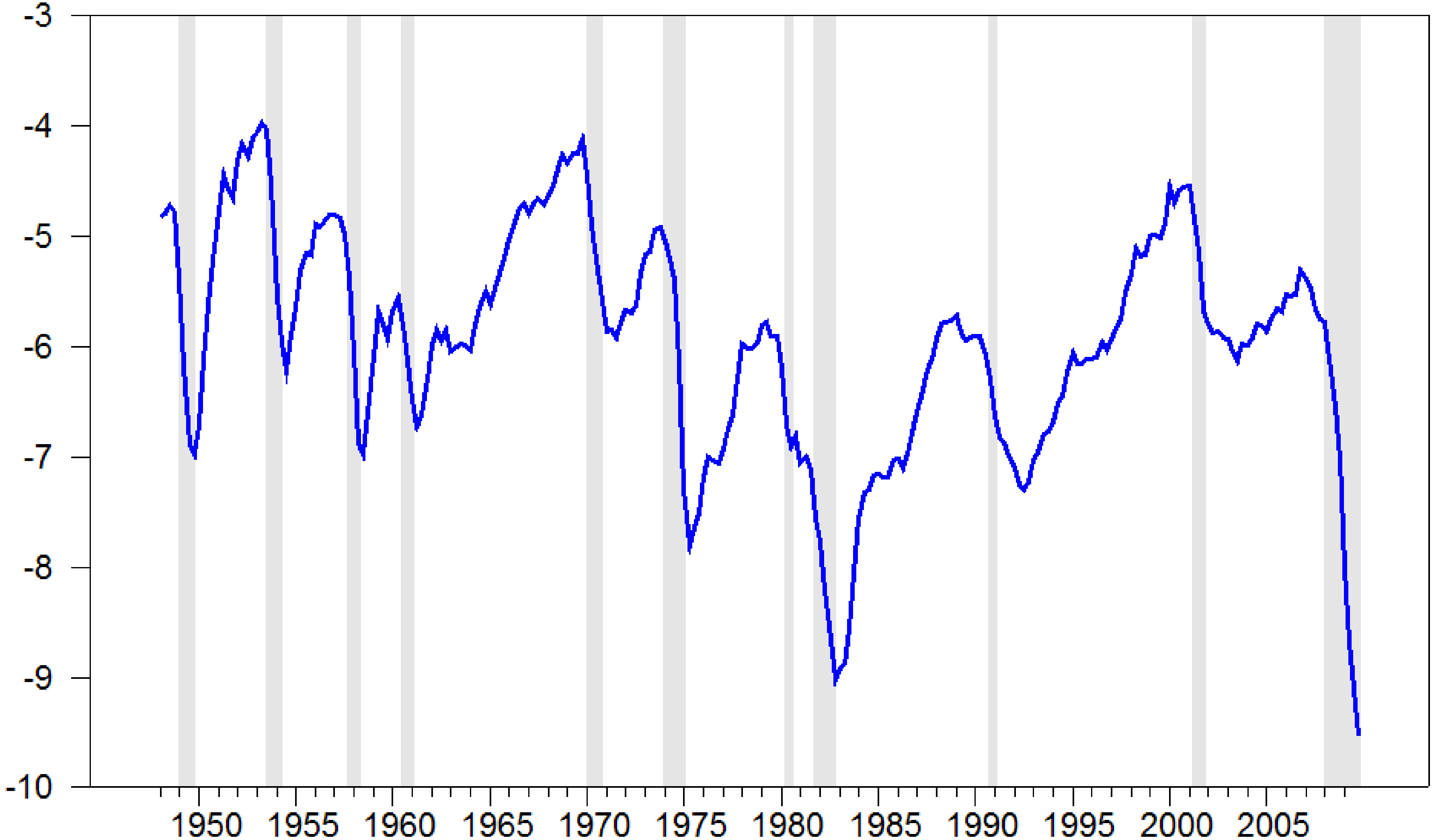


Figure 2.2: The Euro Area Output Gap

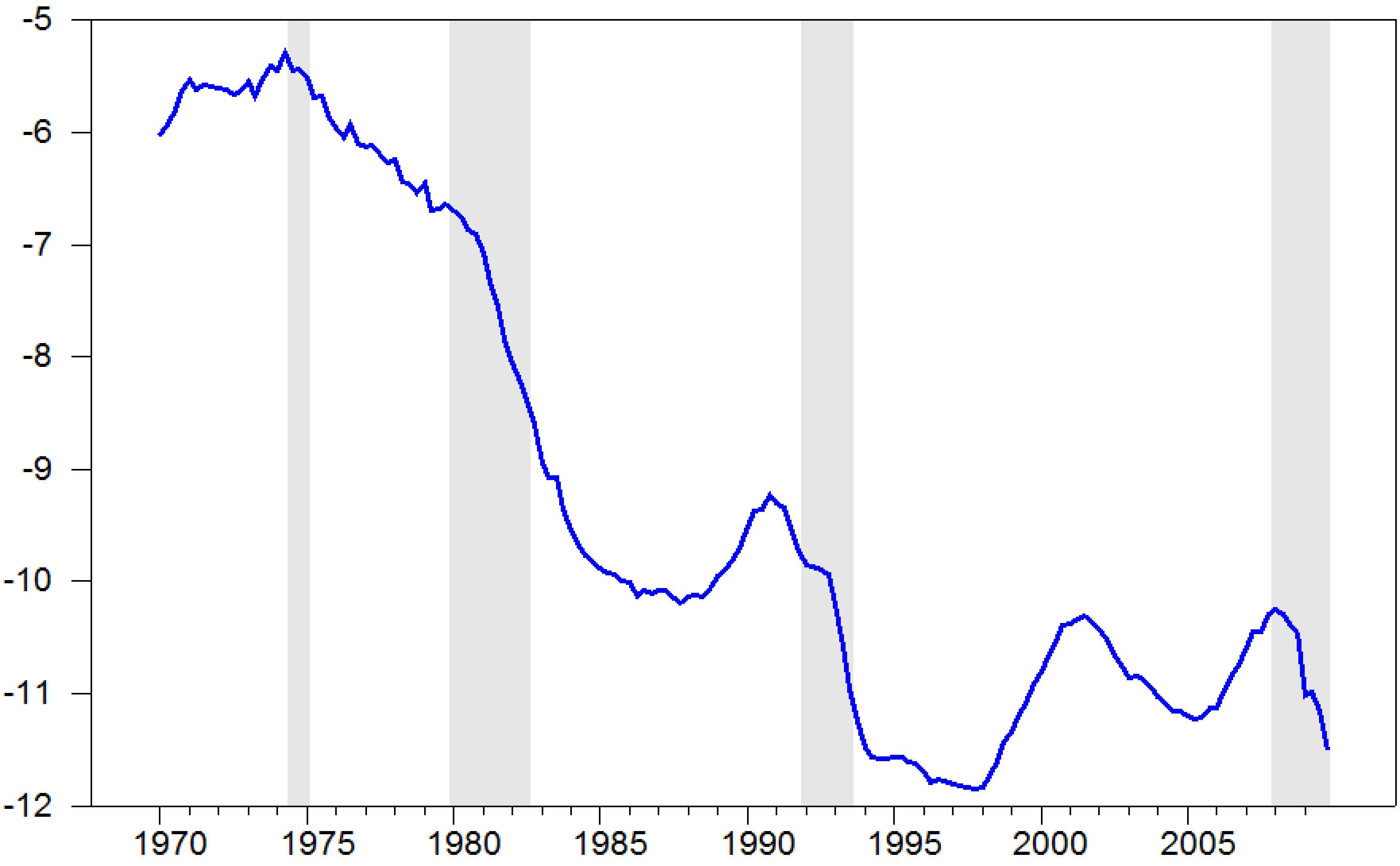


Figure 2.3: The U.S. Output Gap and its Components

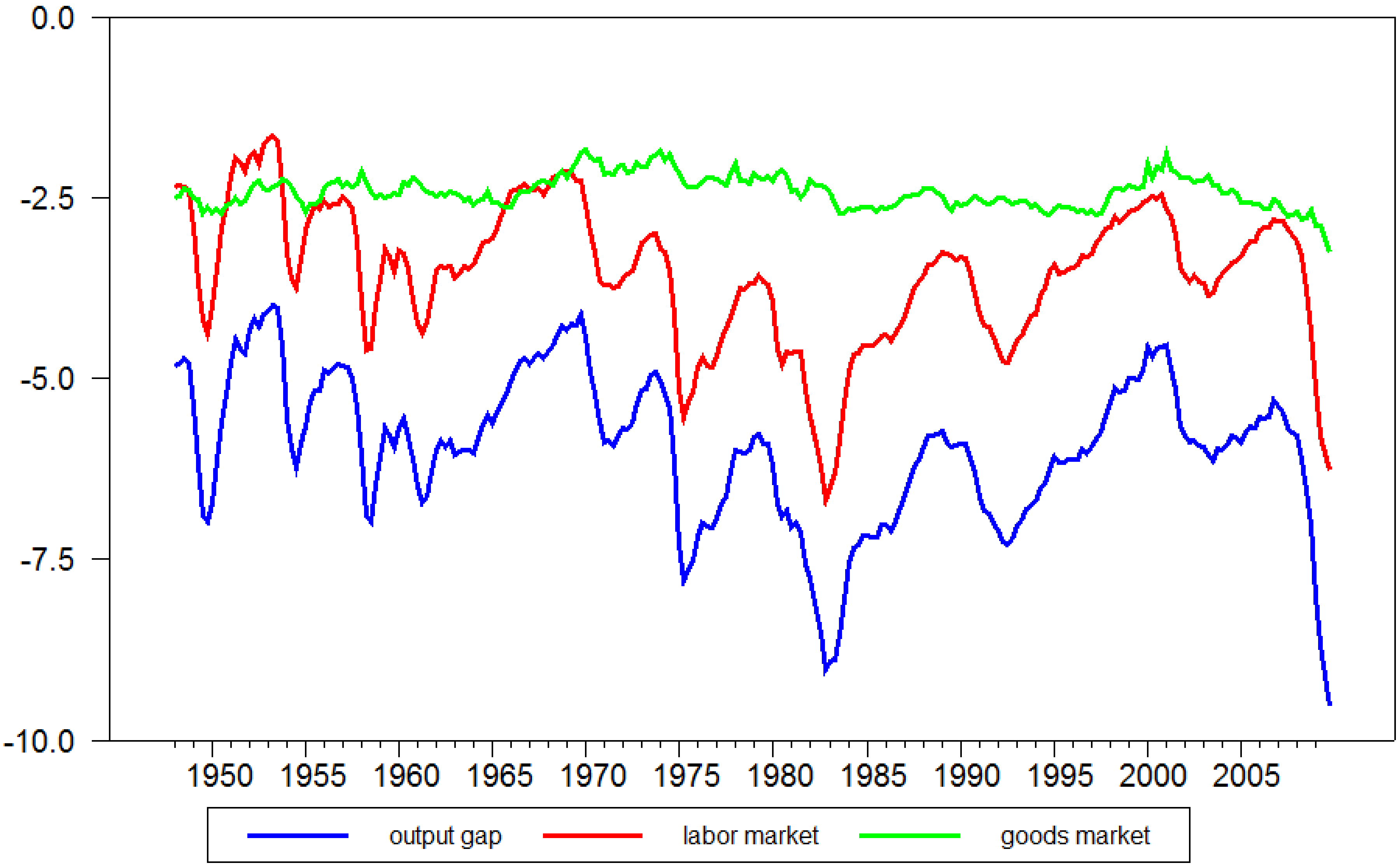


Figure 2.4: The Euro Area Output Gap and its Components

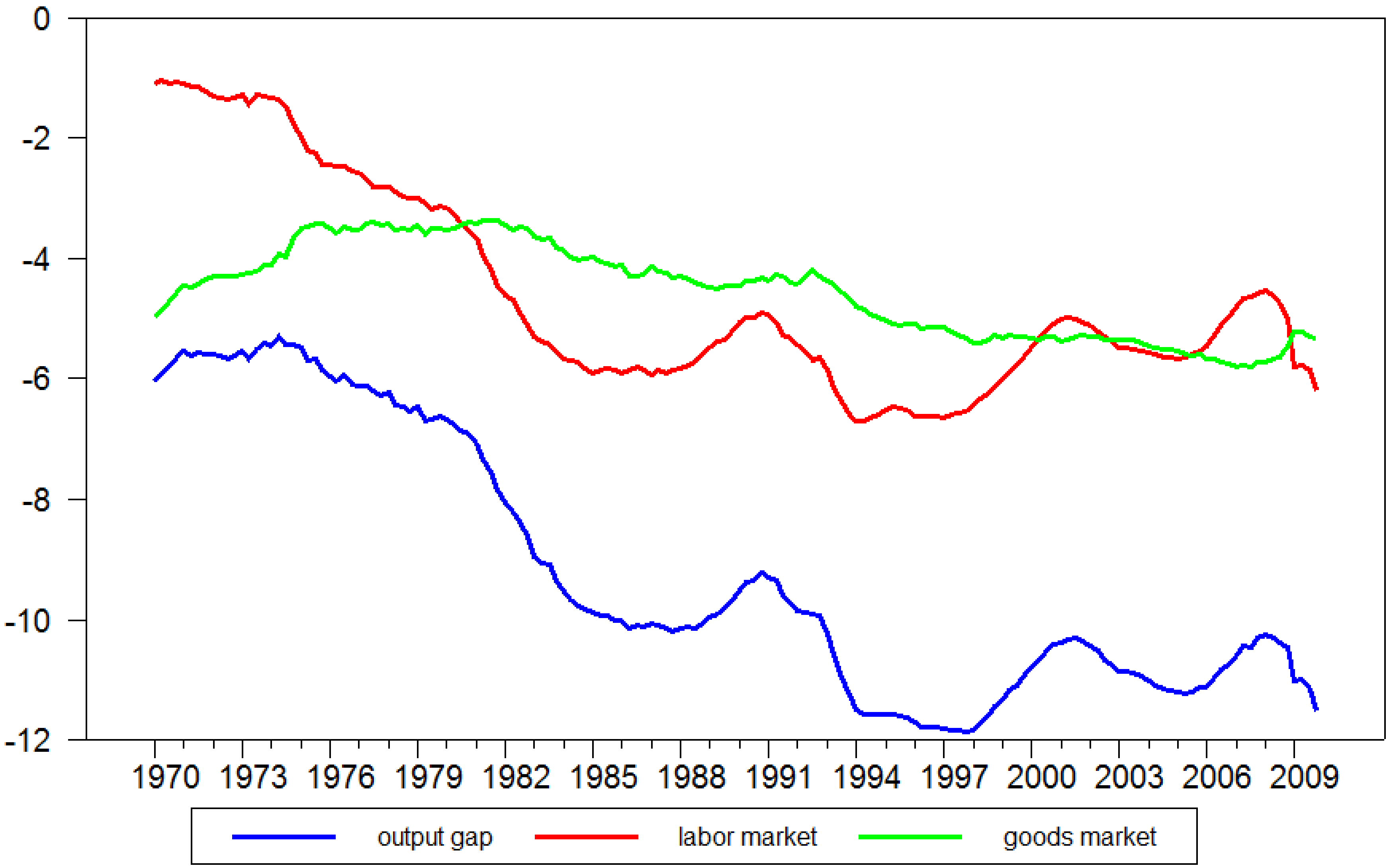


Figure 2.5: Output Gap vs. Detrended GDP: U.S. Evidence

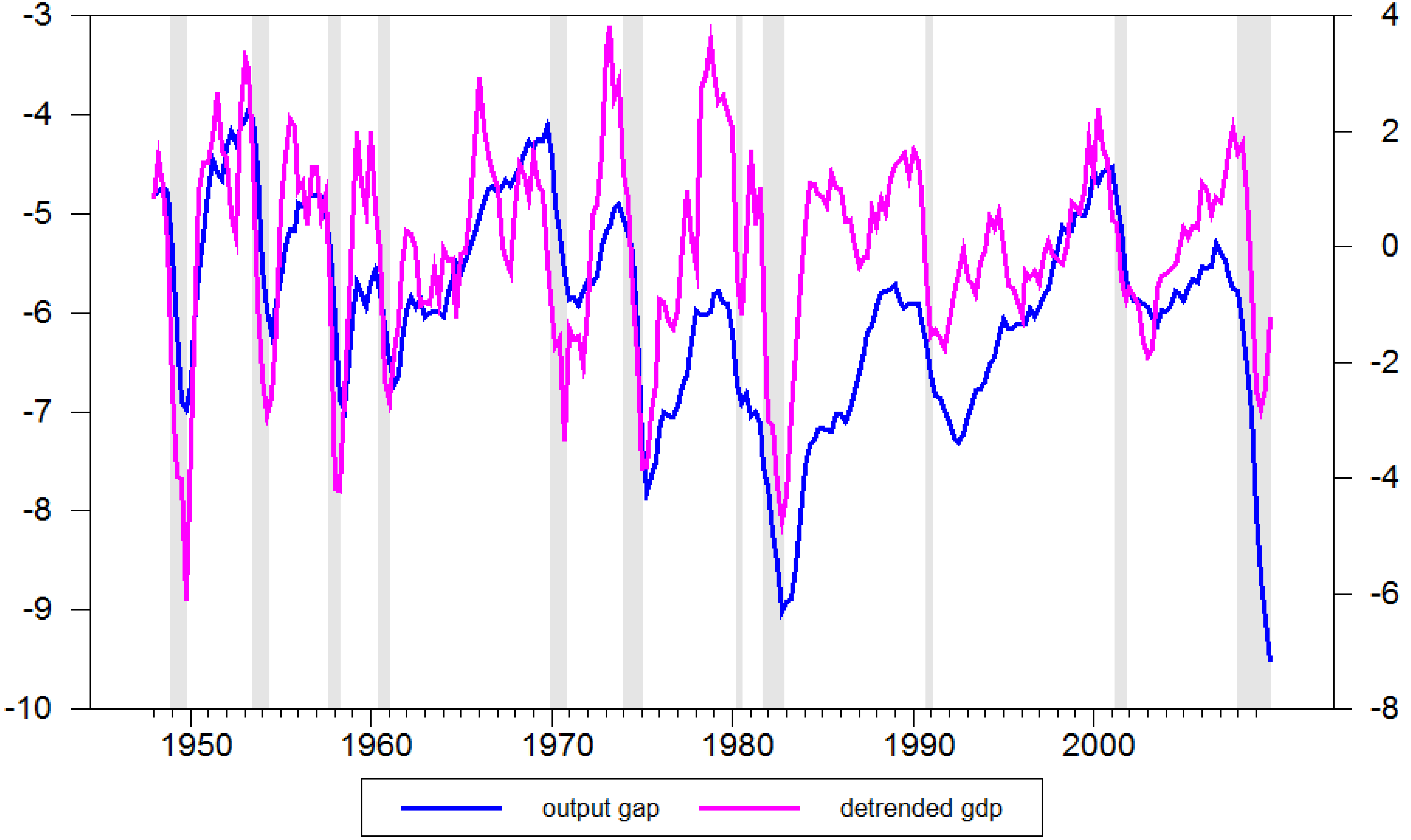


Figure 2.6: The Output Gap vs. Detrended GDP: Euro Area Evidence

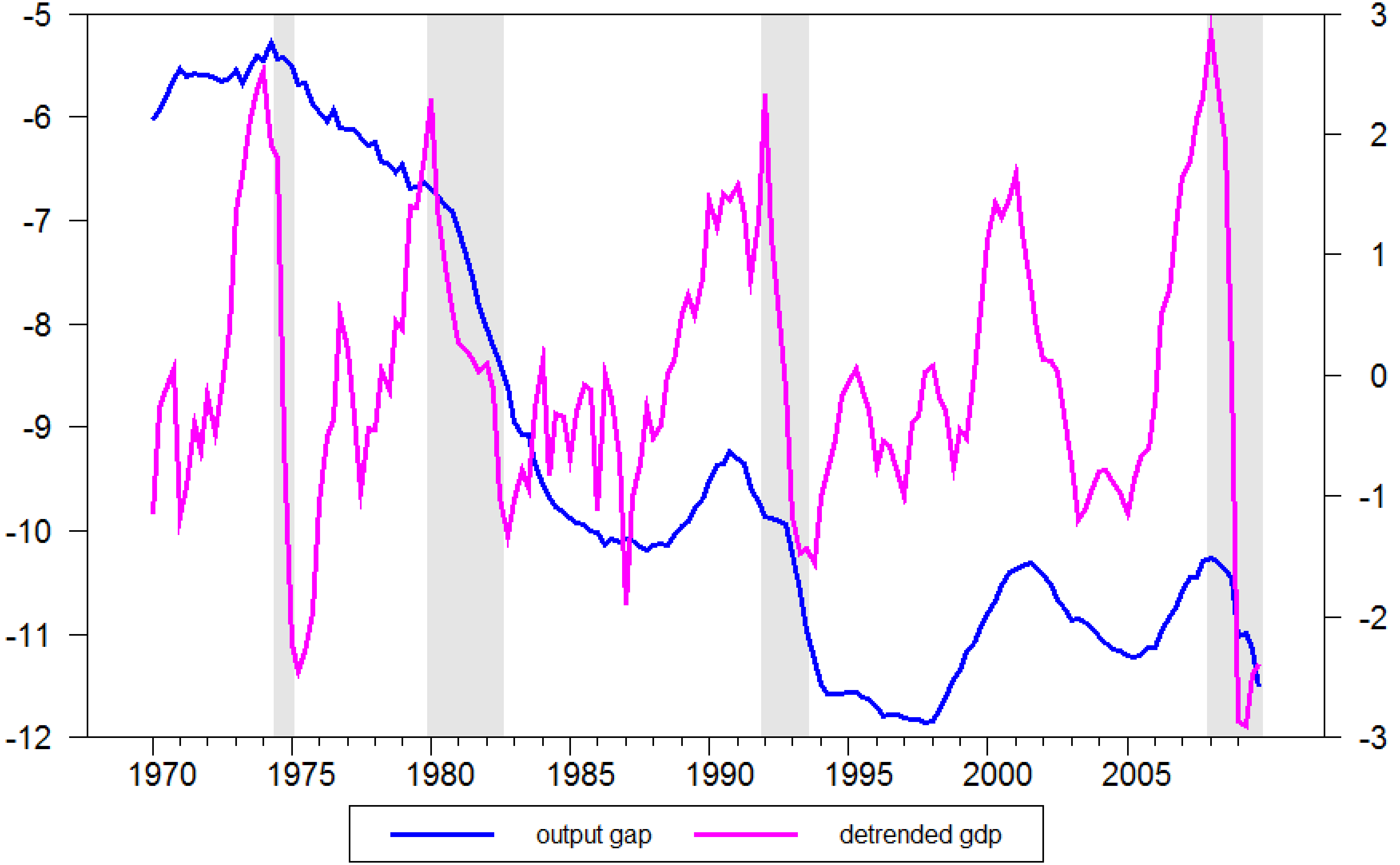


Figure 2.7: The U.S. Output Gap: The Impact of α

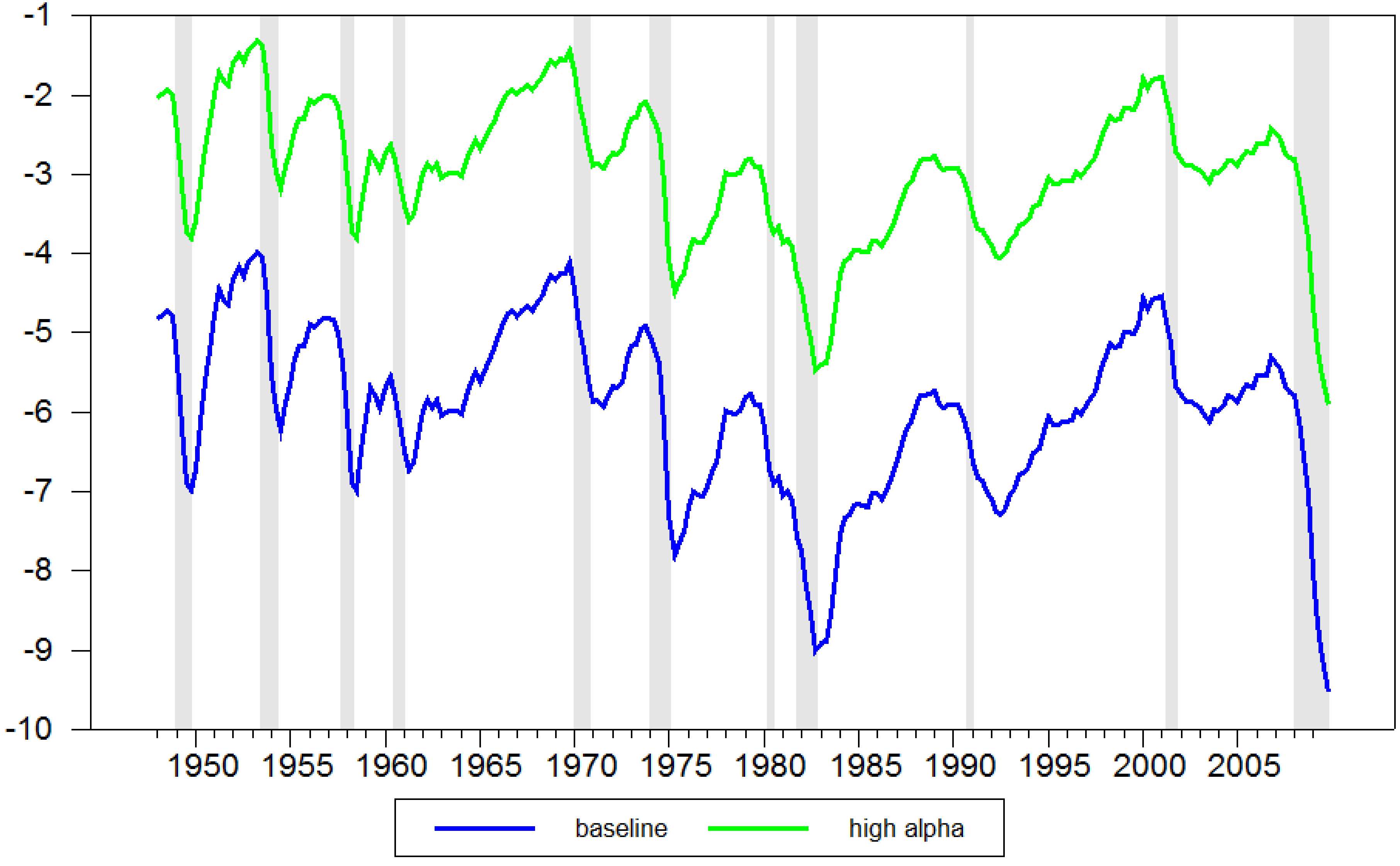
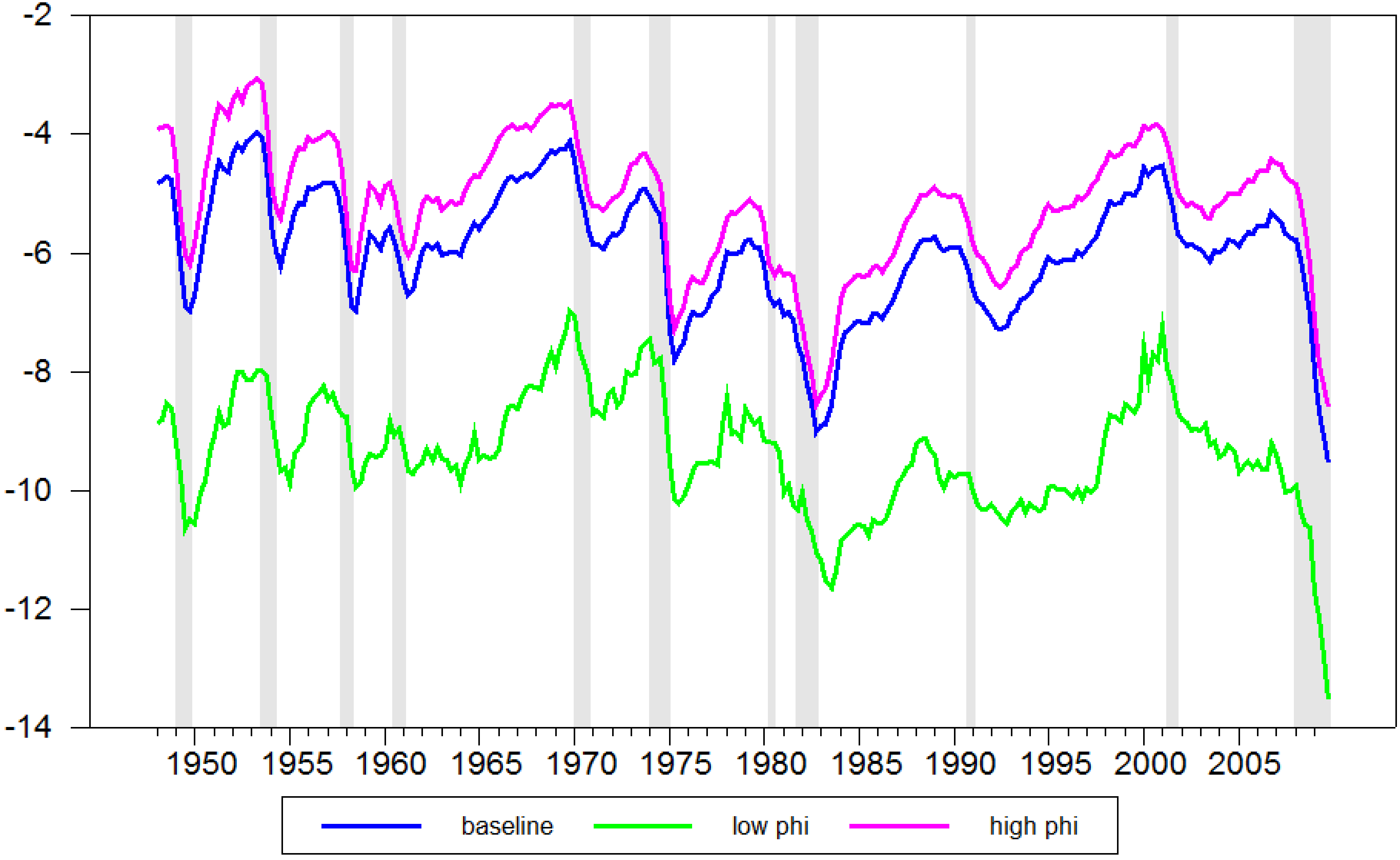


Figure 2.8: The U.S. Output Gap: Alternative Frisch Elasticities



Output Gap Fluctuations and Welfare

- Utility losses caused by deviations from first-best:

$$\begin{aligned}
\mathcal{L}_t &\equiv U_t^e - U_t \\
&= \log(Y_t^e / Y_t) - \left(\frac{\chi_t}{1+\varphi}\right)\left((N_t^e)^{1+\varphi} - N_t^{1+\varphi}\right) \\
&= \log(Y_t^e / Y_t) - \left(\frac{1-\alpha}{1+\varphi}\right)\left(1 - (N_t / N_t^e)^{1+\varphi}\right) \\
&= -x_t - \left(\frac{1-\alpha}{1+\varphi}\right)\left(1 - \exp\left\{\left(\frac{1+\varphi}{1-\alpha}\right) x_t\right\}\right) \equiv \mathcal{L}(x_t)
\end{aligned}$$

Caveat: I ignore dispersion-driven inefficiencies ⇒ lower bound

- Evidence

Figure 2.9: Utility Losses and the Output Gap

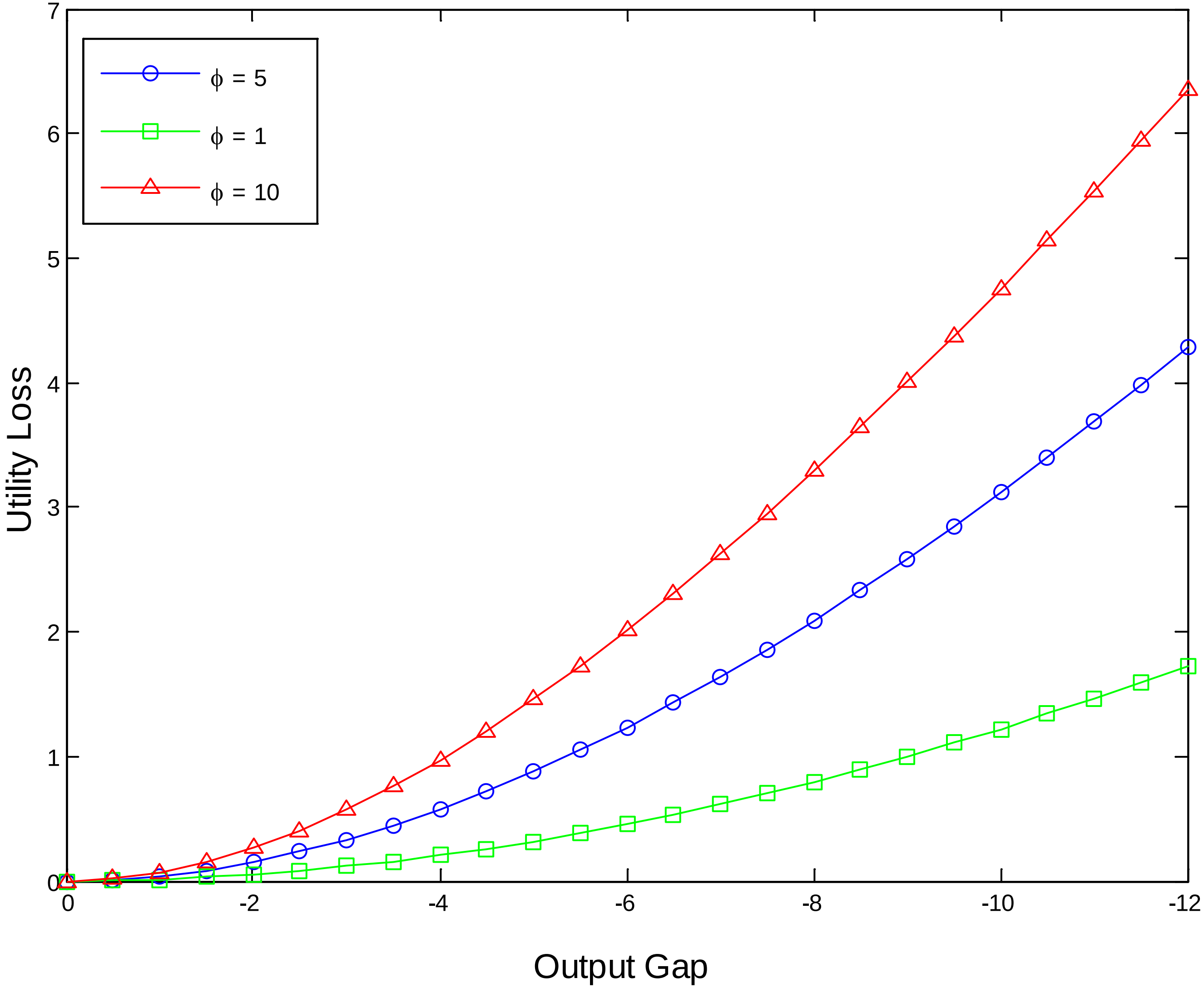


Figure 2.11: Utility Losses and the U.S. Business Cycle

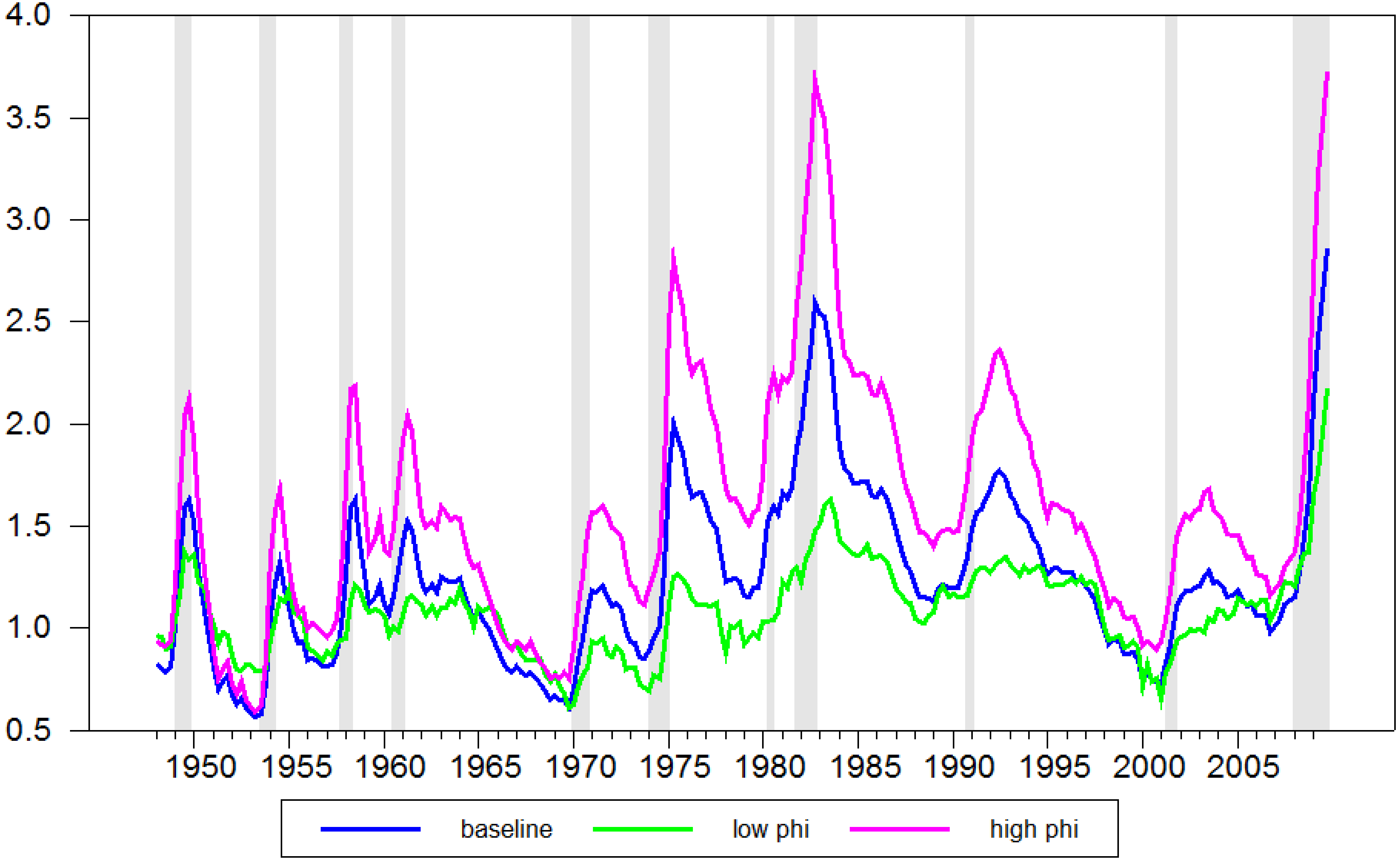
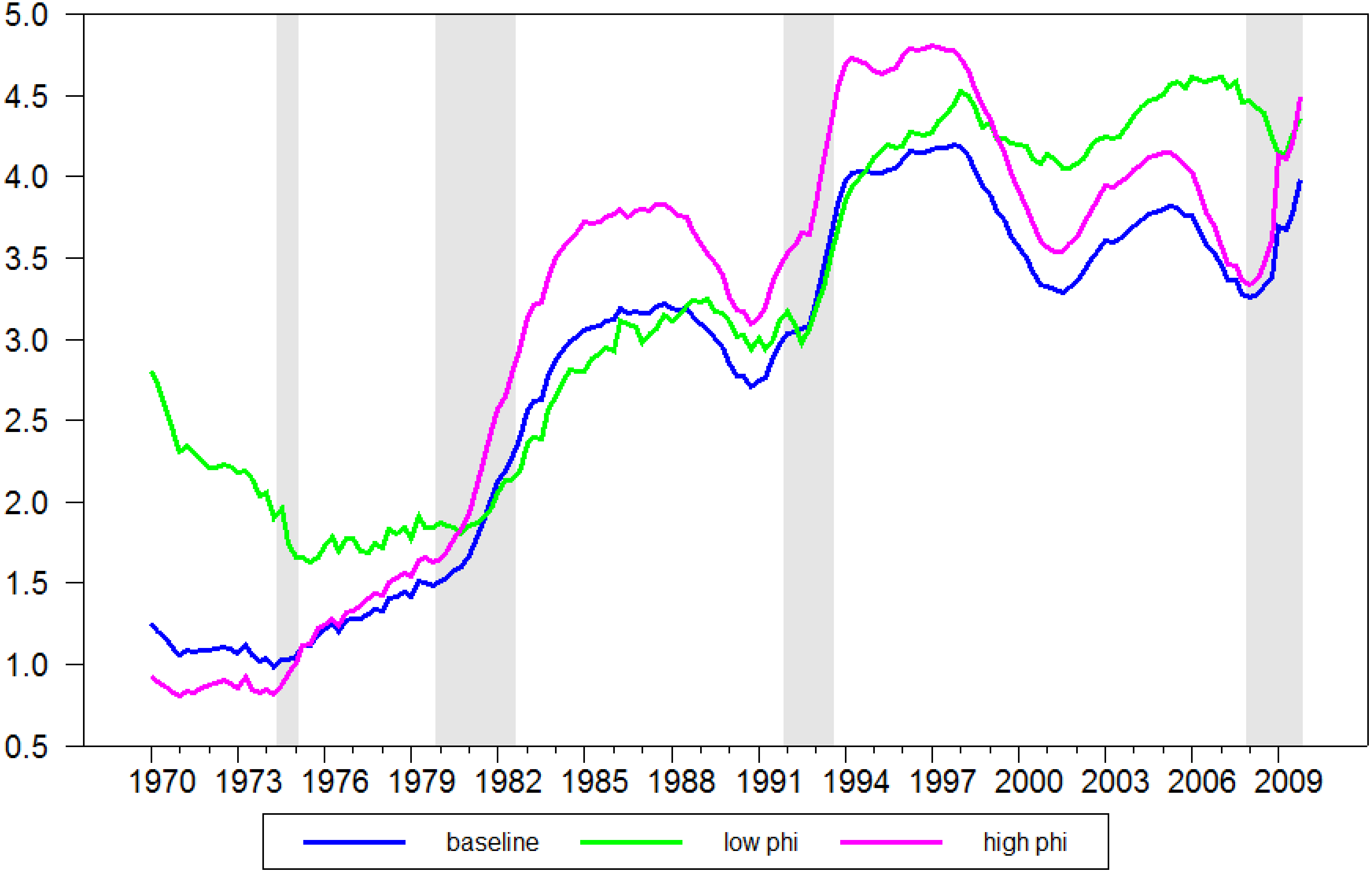


Figure 2.12: Utility Losses and the Euro Area Business Cycle



Output Gap Fluctuations and Welfare

- Utility losses caused by deviations from first-best

$$\mathcal{L}(x_t) = -x_t - \left(\frac{1-\alpha}{1+\varphi}\right)\left(1 - \exp\left\{\left(\frac{1+\varphi}{1-\alpha}\right)x_t\right\}\right)$$

- Utility losses *from fluctuations* (about a given steady state):

$$E\{\mathcal{L}(x_t)\} - \mathcal{L}(x) \simeq \frac{1}{2}\left(\frac{1+\varphi}{1-\alpha}\right) var(x_t)$$

- Evidence

Table 4. Output Gap Fluctuations and Welfare						
	U.S.			*Euro area*		
	$\varphi = 5$	$\varphi = 10$	$\varphi = 1$	$\varphi = 5$	$\varphi = 10$	$\varphi = 1$
$E\{\mathcal{L}(x_t)\}$	1.23	1.58	1.08	2.76	3.08	3.19
$E\{\mathcal{L}(x_t)\} - \mathcal{L}(x)$	0.04	0.08	0.01	0.18	0.32	0.11
$E\{\mathcal{L}(x_t)\} - E\{\mathcal{L}(x_t \geq x)\}$	0.16	0.24	0.09	0.52	0.63	0.49
$E\{\mathcal{L}(x_t)\} - E\{\mathcal{L}(x_t + \Delta)\}$	0.22	0.34	0.08	0.31	0.43	0.13

Conclusions

- Large variations in the degree of efficiency of the economy, as measured by the output gap.

  - in the U.S.: closely related to traditional measures of the business cycle.
  - in the Euro area: nonstationary component, beyond cyclical fluctuations.

- Substantial utility costs of an inefficient level of activity, especially in recessions.
- Average costs of inefficient fluctuations are small.
- Policy implications? Need to account for inflation-related distortions (part III). Preview: optimized simple policy rule responds significantly to the unemployment rate