Business Cycle Accounting the U.S. recession in 2008-2009

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Model

- Households, $N_t = (1 + g_n)^t$

$$\max \quad E\sum_{t=0}^{\infty} \beta^t U(c_t, 1 - l_t)N_t, \quad U(c, l) = \frac{(c(1-l)^{\psi})^{1-\sigma}}{1-\sigma}$$

$$\text{s.t.} \quad c_t + (1 + \tau_{xt})x_t = r_t k_t + (1 - \tau_{lt})w_t l_t + T_t$$

$$N_{t+1}k_{t+1} = N_t[(1 - \delta)k_t + x_t], \quad c_t, x_t \geq 0$$

- Firm, $Z_t = z_t(1 + g_z)^t$

$$\max \quad F(K_t, Z_t L_t) - r_t K_t - w_t L_t, \quad F(K, ZL) = K^{\theta}(ZL)^{1-\theta}$$

- Government

$$G_t + N_t T_t = N_t(\tau_{lt} w_t l_t + \tau_{xt} x_t)$$

- Markets clear

$$N_t(c_t + x_t) + G_t = F(K_t, Z_t L_t)$$

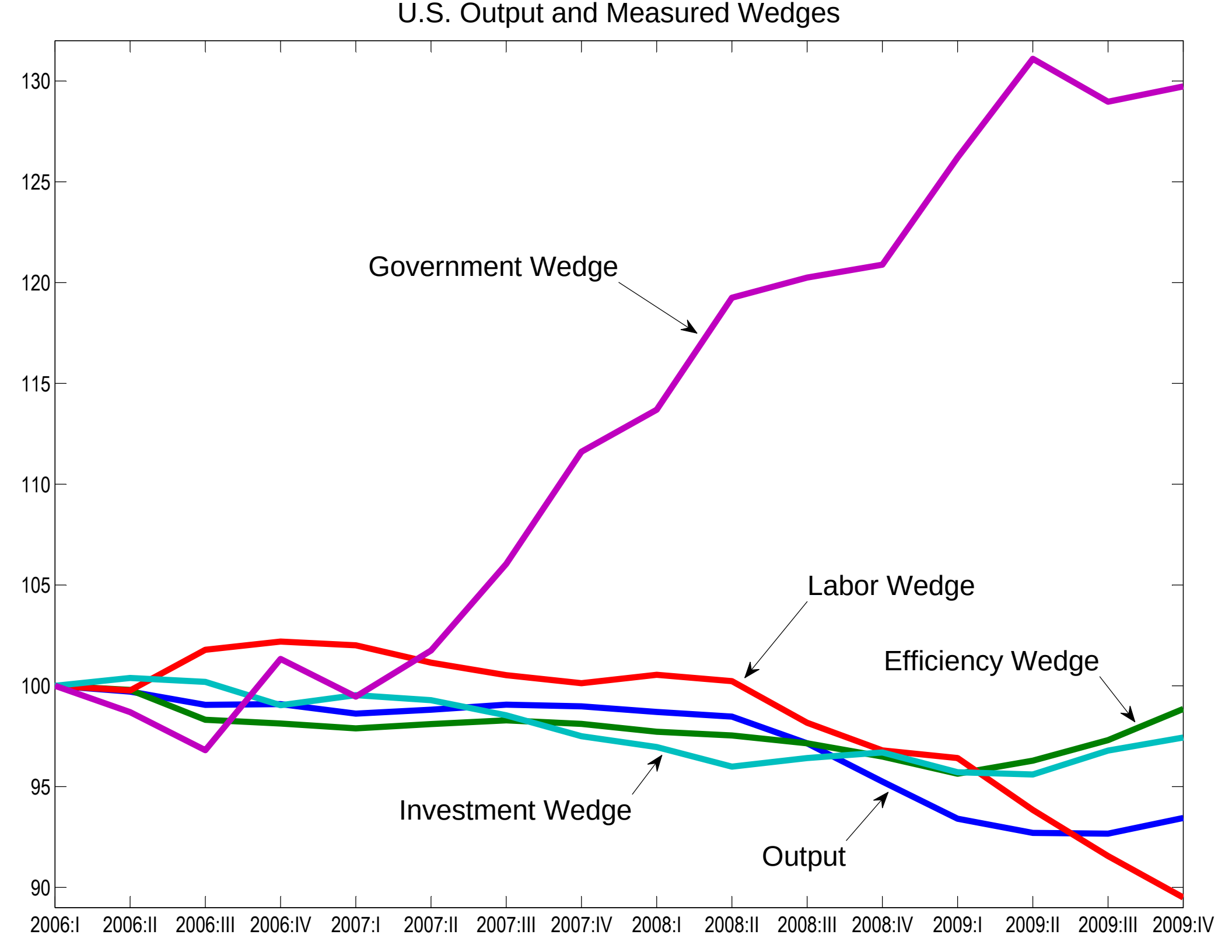
$$N_t k_t = K_t$$

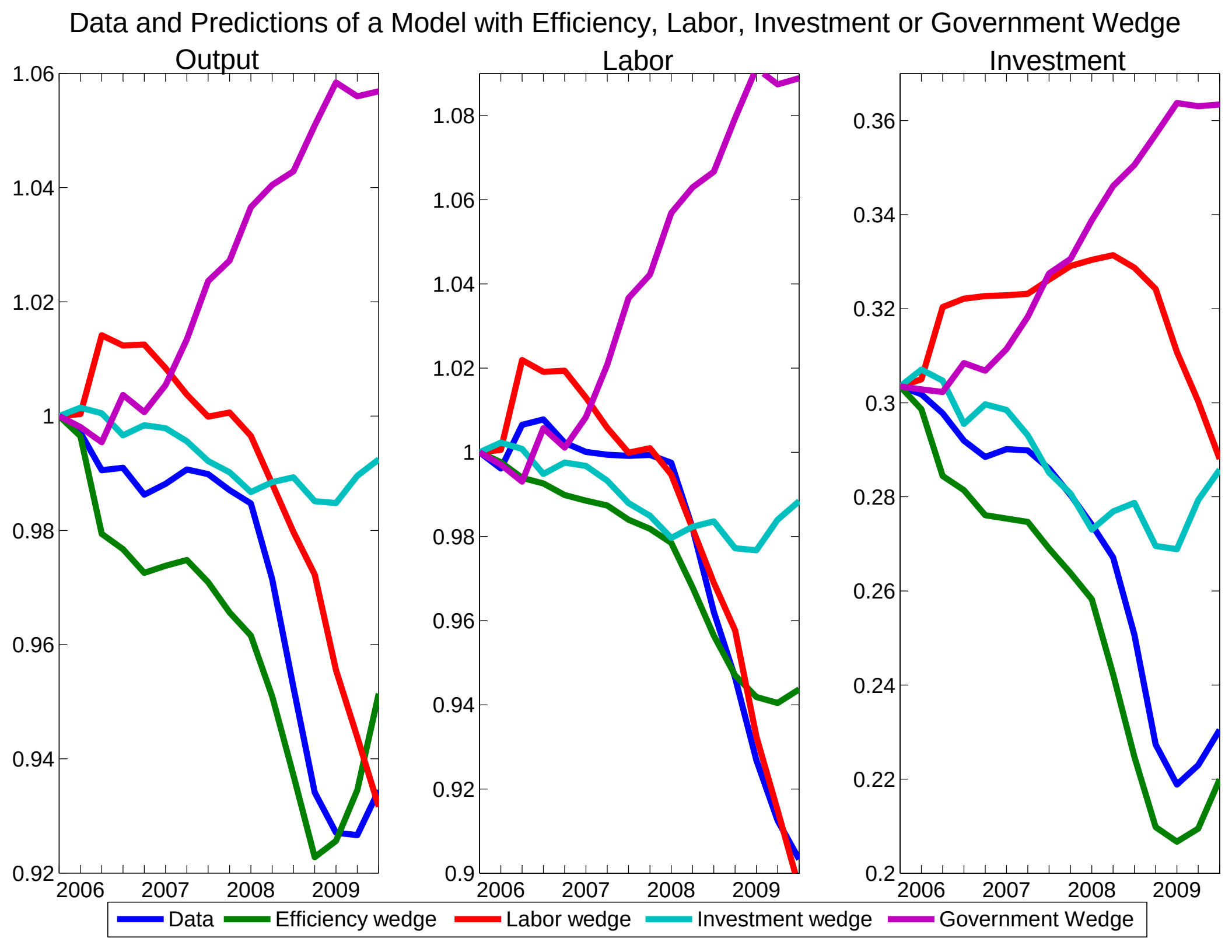
$$N_t l_t = L_t$$

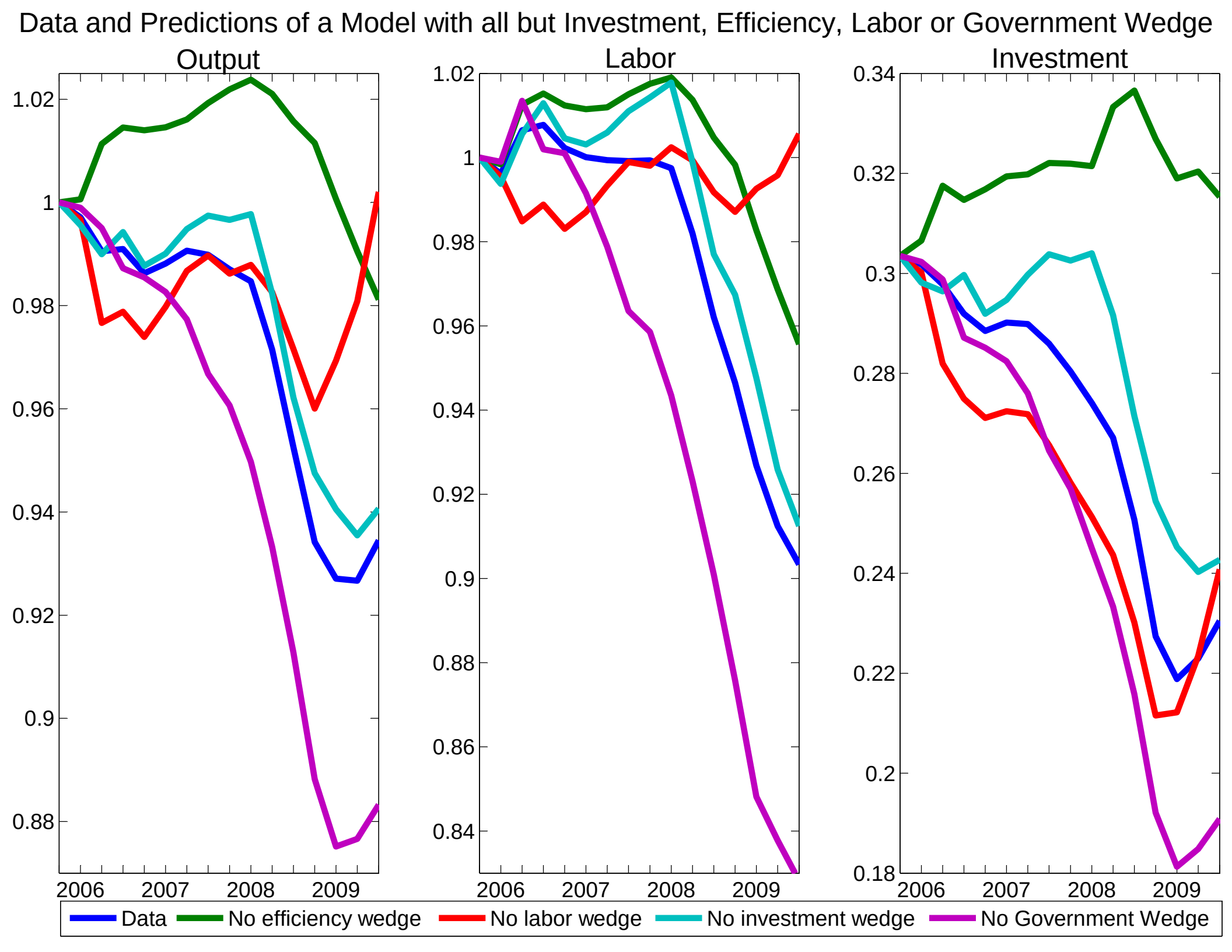
Goal: Estimate 30 parameters of AR(1) process for wedges $s_t = \{z_t, \tau_{lt}, \tau_{xt}, g_t\}$

$$s_{t+1} = P_0 + P s_t + \varepsilon_{t+1}$$

using MLE given the quarterly data on y_t, l_t, x_t, g_t from 1947:I to 2009:IV.


U.S. Output and Measured Wedges
130
125
120
115
110
105
100
95
90
2006:I
2006:II
2006:III
2006:IV
2007:I
2007:II
2007:III
2007:IV
2008:I
2008:II
2008:III
2008:IV
2009:I
2009:II
2009:III
2009:IV
Government Wedge
Labor Wedge
Efficiency Wedge
Investment Wedge
Output


Data and Predictions of a Model with Efficiency, Labor, Investment or Government Wedge
Output
Labor
Investment
1.06
1.04
1.02
1
0.98
0.96
0.94
0.92
1.08
1.06
1.04
1.02
1
0.98
0.96
0.94
0.92
0.9
0.36
0.34
0.32
0.3
0.28
0.26
0.24
0.22
0.2
2006
2007
2008
2009
Data
Efficiency wedge
Labor wedge
Investment wedge
Government Wedge


Data and Predictions of a Model with all but Investment, Efficiency, Labor or Government Wedge
Output
Labor
Investment
1.02
1
0.98
0.96
0.94
0.92
0.9
0.88
0.86
0.84
0.34
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
2006
2007
2008
2009
Data
No efficiency wedge
No labor wedge
No investment wedge
No Government Wedge