

**Stabilization of Industrial Cycles by
Profit Sharing Policies
Localized near Stationary States**

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Abstract.

- This paper illustrates how dangerous linear thinking and linear control could be if overstretched.
- Effective stabilization of industrial cycles by standard profit sharing policies is feasible mostly near stationary states.
- The paper calls for organic profit sharing.

Ancestors

The R.M. Goodwin (1972) model M-1

“Neoclassical hijacking” of M-1 in P-1 in F. Ploeg (1985)

L. Aguiar-Conraria (2008) check of P-1 structural stability in P-2

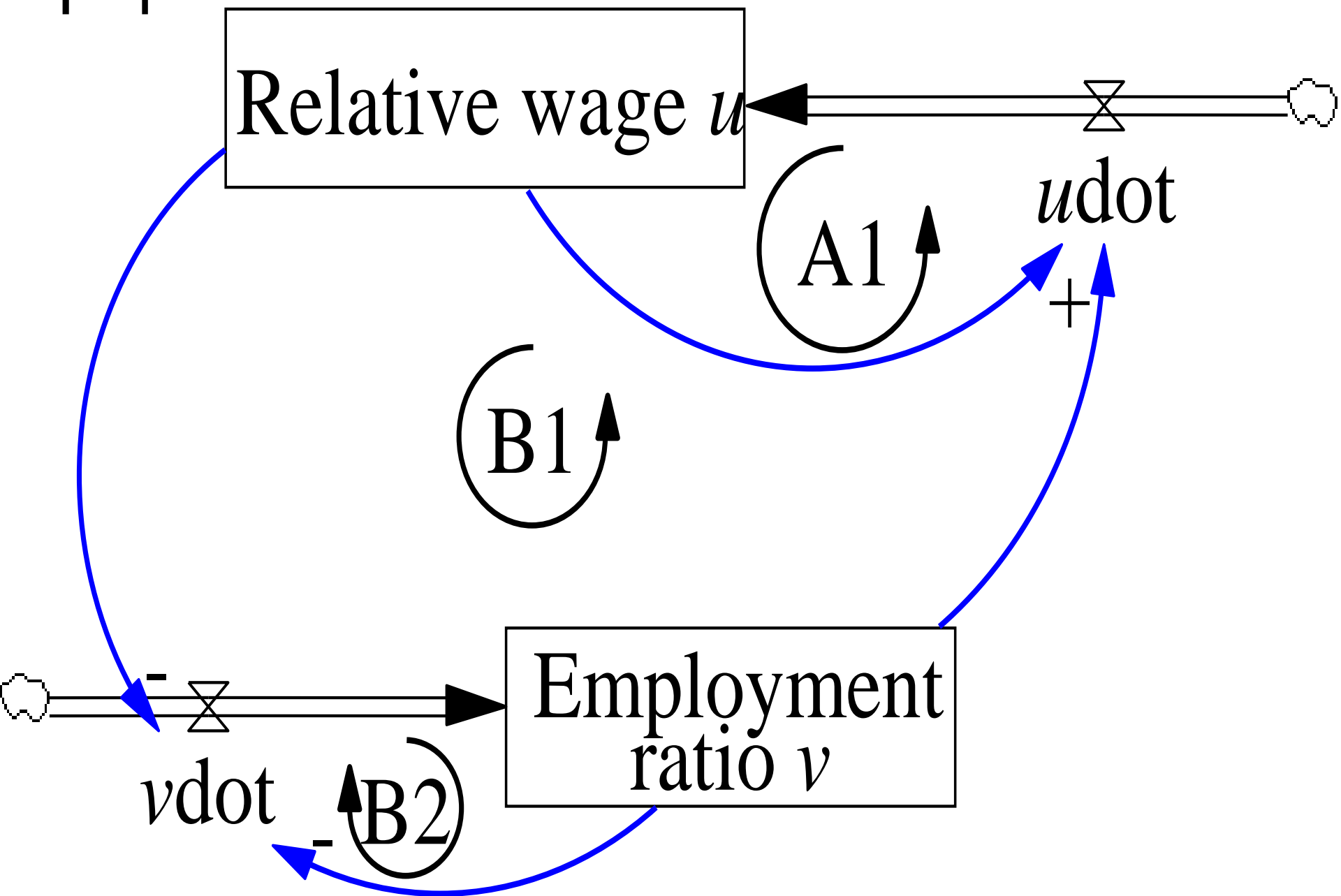
The main variables are relative wage and employment ratio, a ratio of investment to profit is constant. The spurious efficiency wage hypothesis supports equations for a growth rate of output per worker.

Workers’ competition for jobs is stabilizing and their fight for increased wages is destabilizing. In each model, a stationary state is LAS in a system of two ODEs. Deceptively, there is no possibility for endogenous industrial cycle.

Table 1. Main variables in Z-1 as generalization of P-1 and P-2

Variable	Expression
Net product	q
Fixed production assets	k
Capital-output ratio	$s = k/q$
Employment	l
Employment in efficiency units	l_e
Output per worker	$a = q/l$
Labour force	$n = n_0 e^{\beta t}, \beta \geq 0$
Wage	w
Total wage	wl
Relative wage (unit value of labour power)	$u = w/a = wl/q$

P-1



P-2

Relative wage u

R1

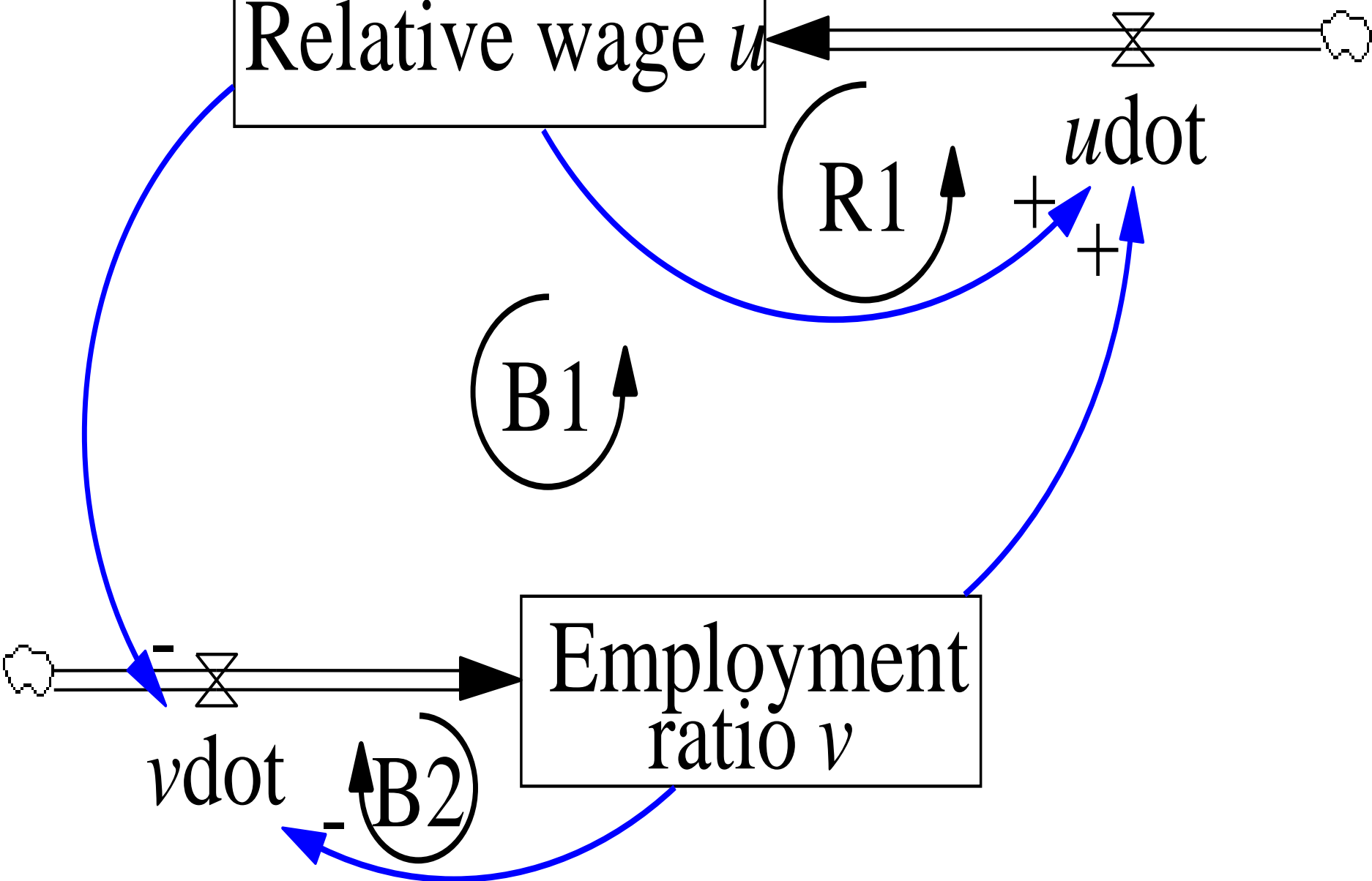
$u\dot{}$

B1

Employment ratio v

$v\dot{}$

B2

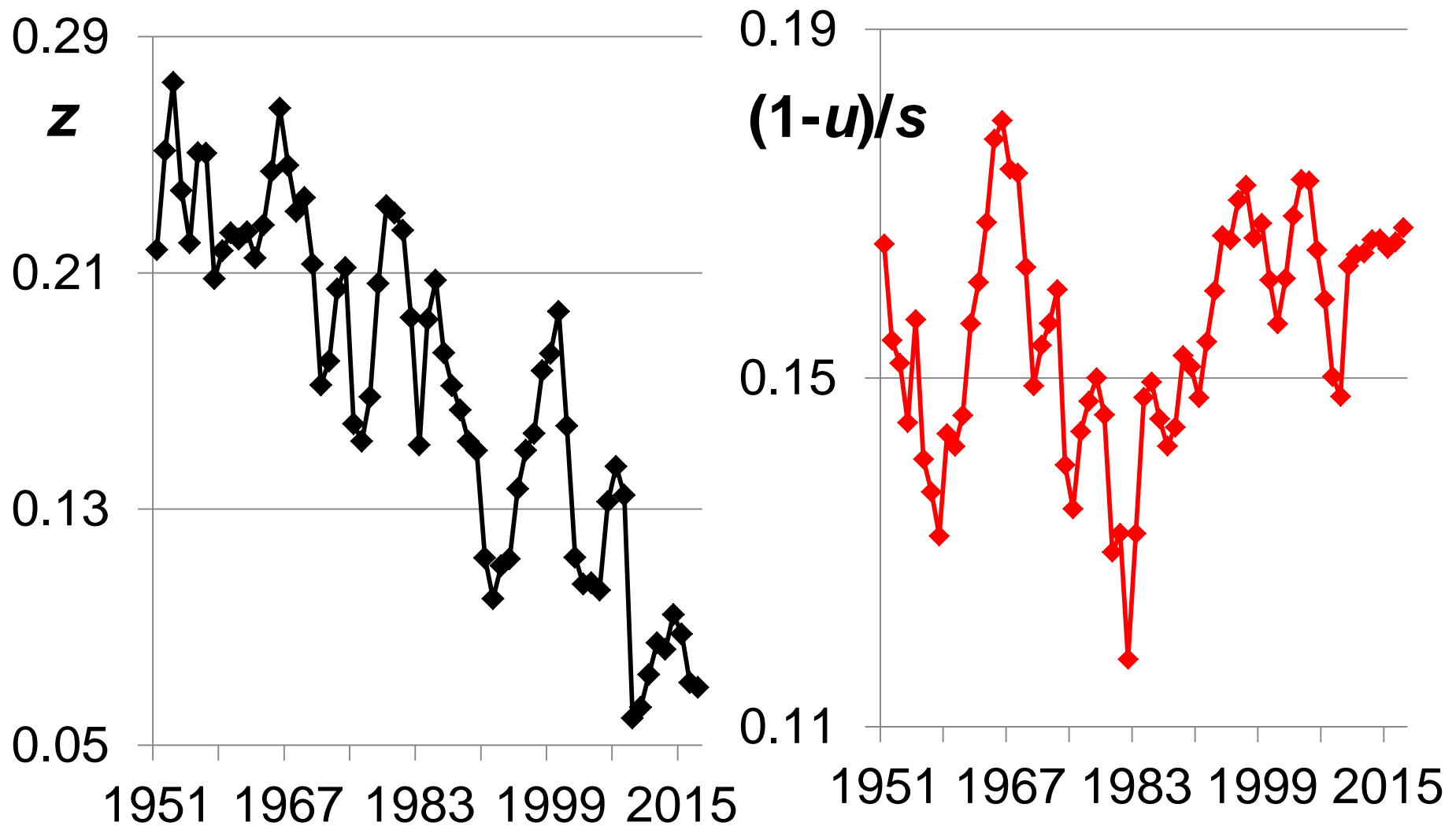


Background

Z-1 reflects destabilizing cooperation and stabilizing competition of investors. In a system of three ODEs, rate of capital accumulation becomes the new phase variable. Its targeted long-term decrease raises profit rate together with reducing relative wage and capital-output ratio. Oscillations imitating industrial cycles are endogenous. Crisis is a manifestation of relative and absolute over-accumulation of capital.

Z-1 treats industrial cycles as capital accumulation cycles. A limit cycle is born through super-critical Andronov – Hopf bifurcation. Dual nature of capital as the driver and barrier of capitalist production is reflected.

Accumulation rate z and profit rate $(1-u)/s$ in the USA, 1951-2017



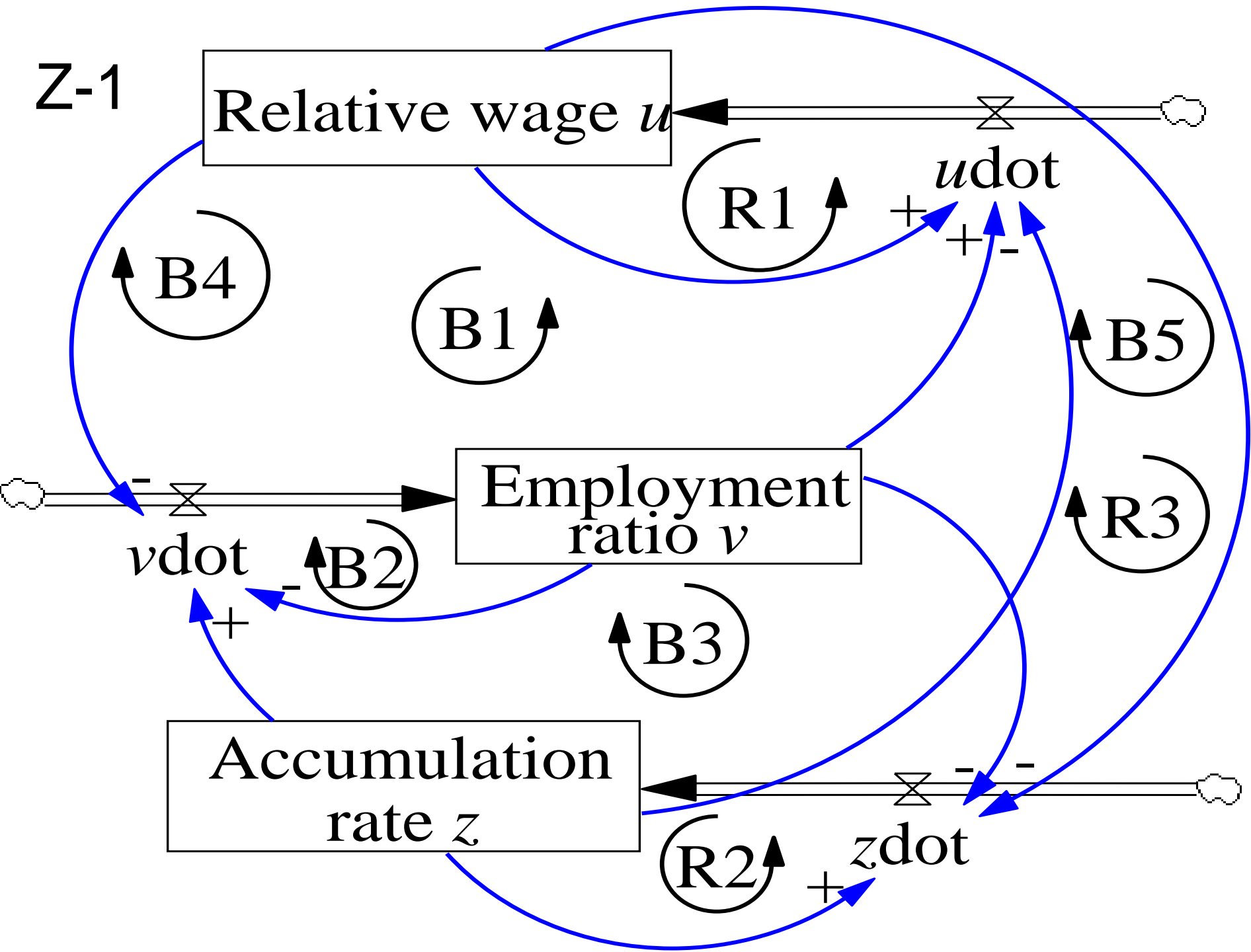
Extension of P-2 in Z-1

In agreement with K. Marx (1867: 634) net change of the share of investment in surplus product has an opposite sign to relative wage gains ($b > 0$, $0 < z_b < z_0 \leq 1 \leq Z$);

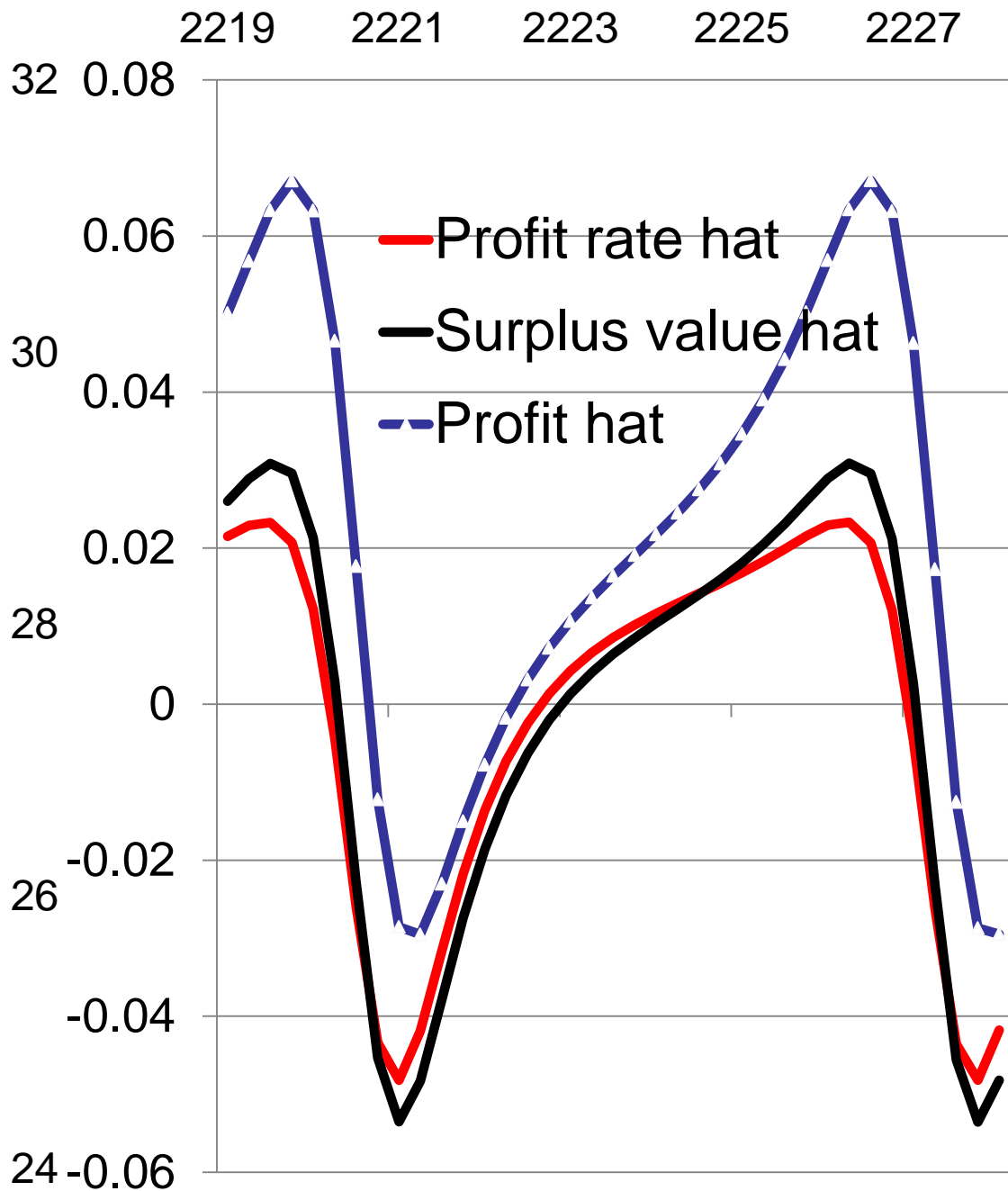
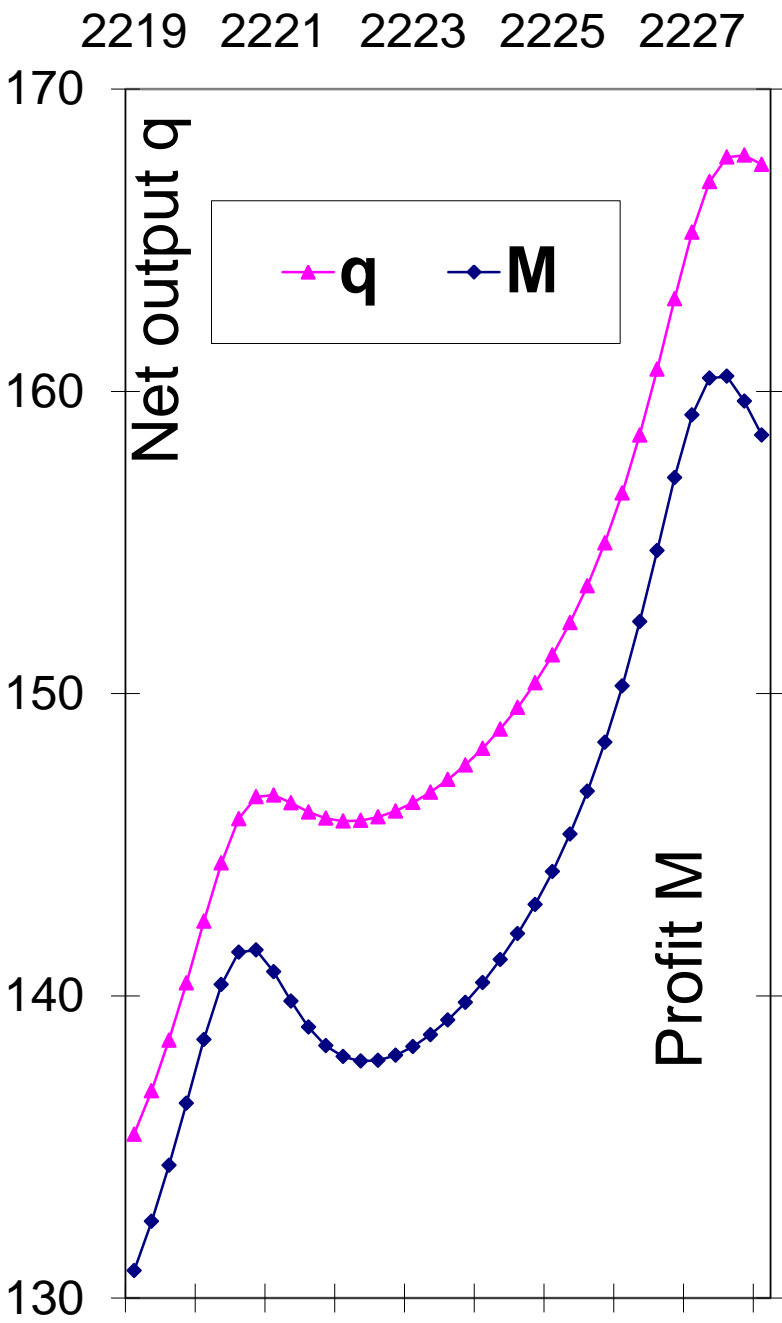
logic of logistic growth and

proportional control applied additionally ($p > 0$):

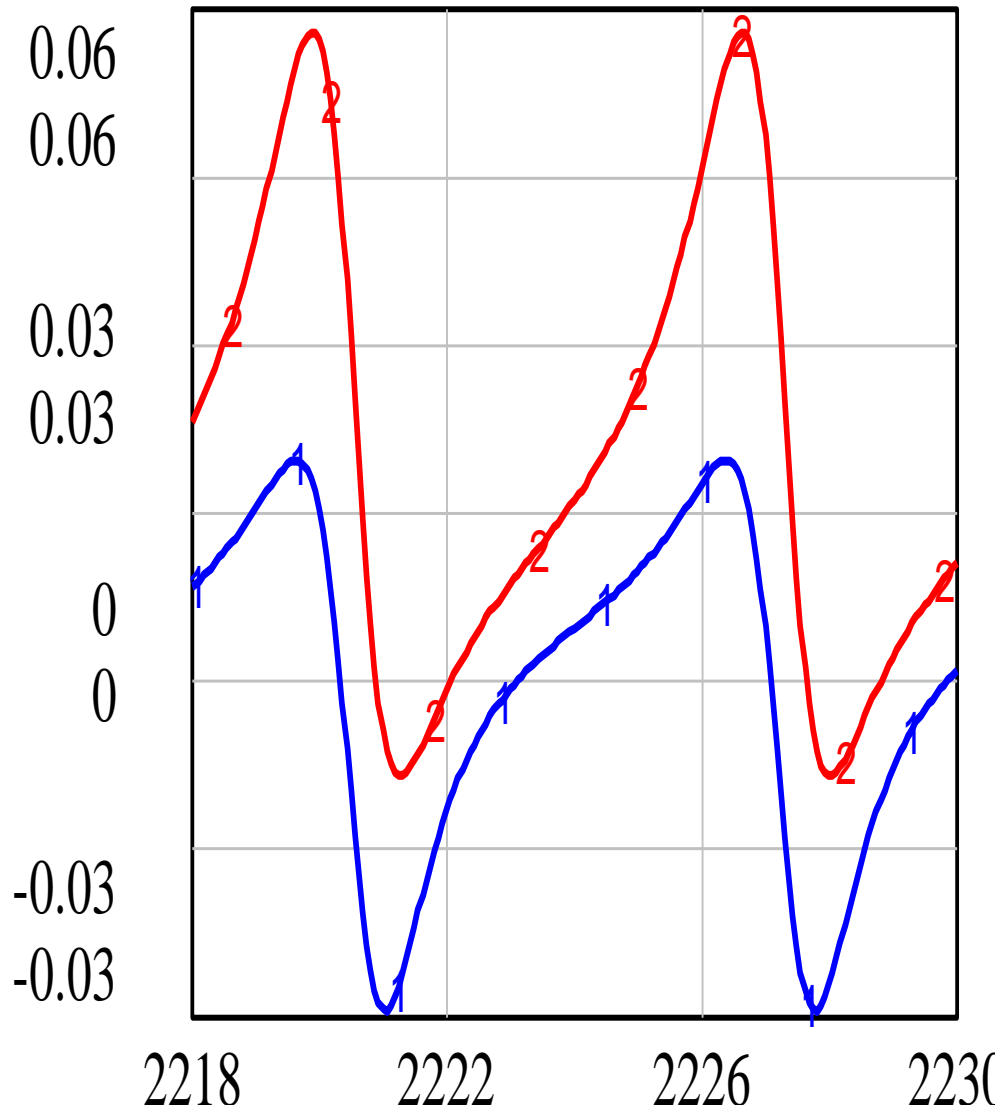
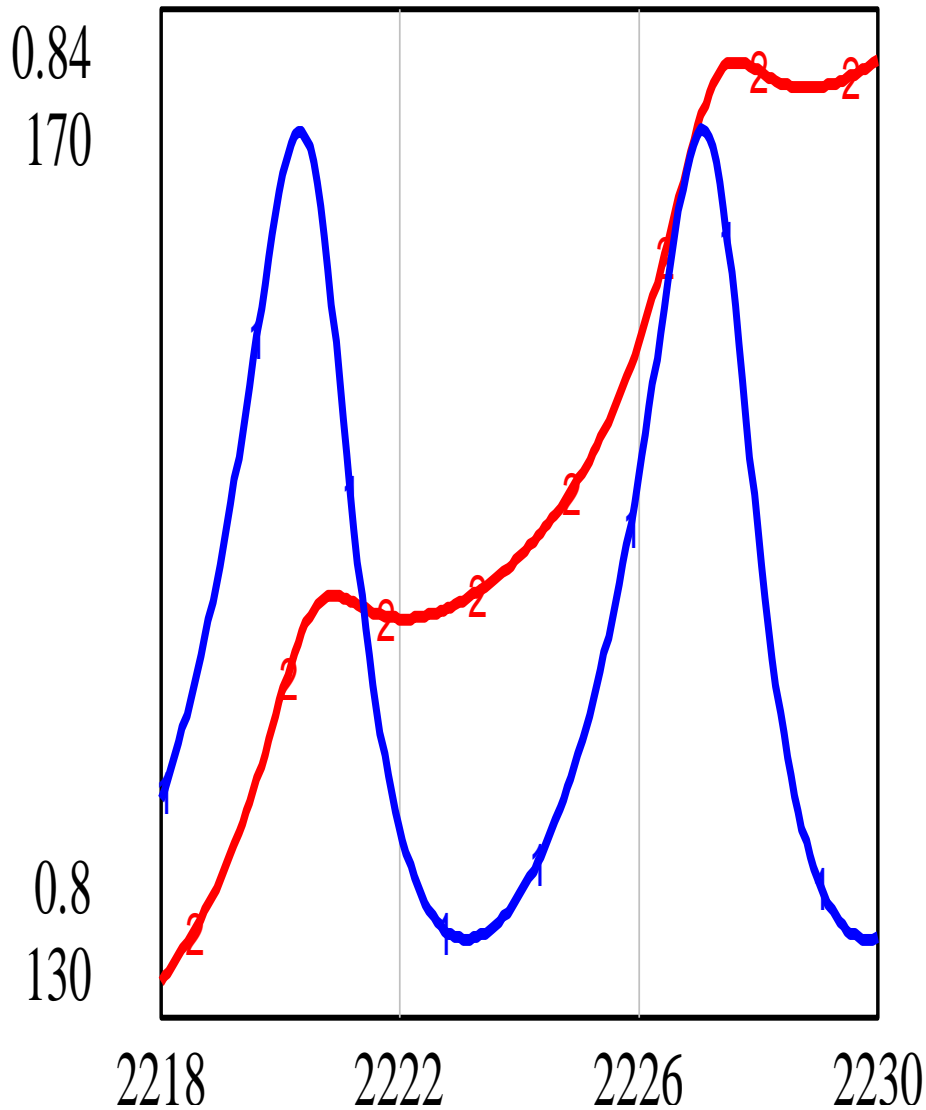
$$\dot{z} = -b \frac{\dot{u}}{1-u} z (Z - z) + p(z_b - z)$$



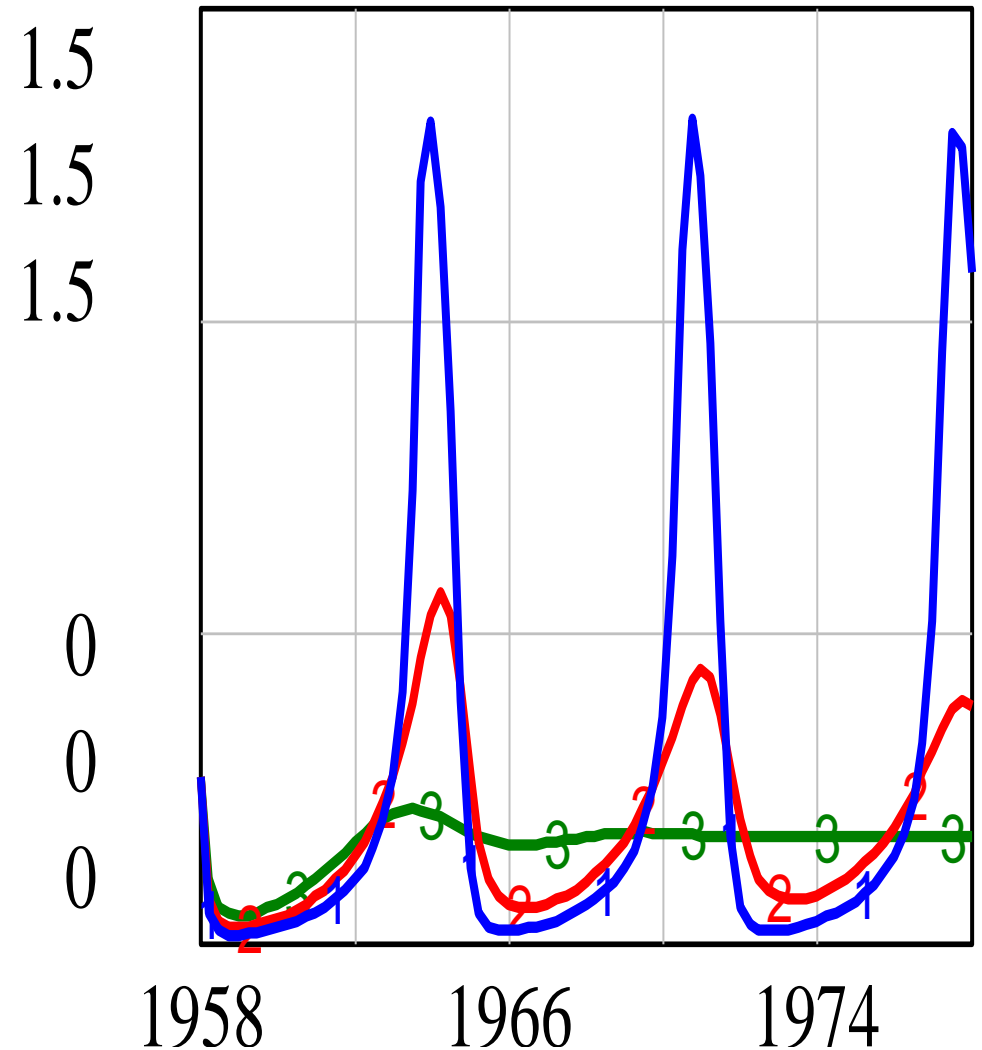
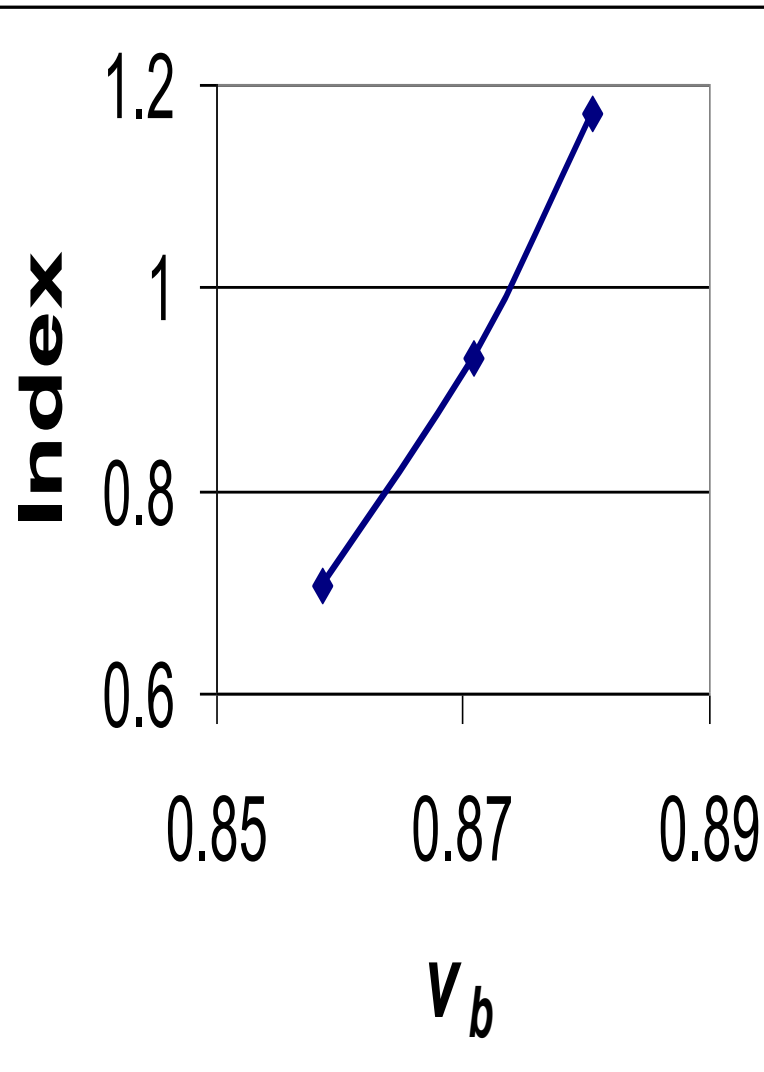
- *Proposition.* In Z-1, stationary state E_b is locally asymptotically stable for $b \leq b_0$; E_b loses its stability and Andronov – Hopf bifurcation does take place at $b_{critical} > b_0$.
- According to simulations, a supercritical bifurcation occurs. The period of oscillations is about ≈ 7 (years).
- For $\gamma = 0.75$ and $b = b_{critical} = 57.4 > b_0 = 54.4$, there is a transition to a limit cycle vicinity (up to years 2200–2230) from the initial phase vector x for 1958.



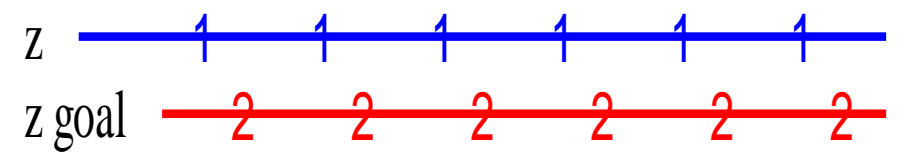
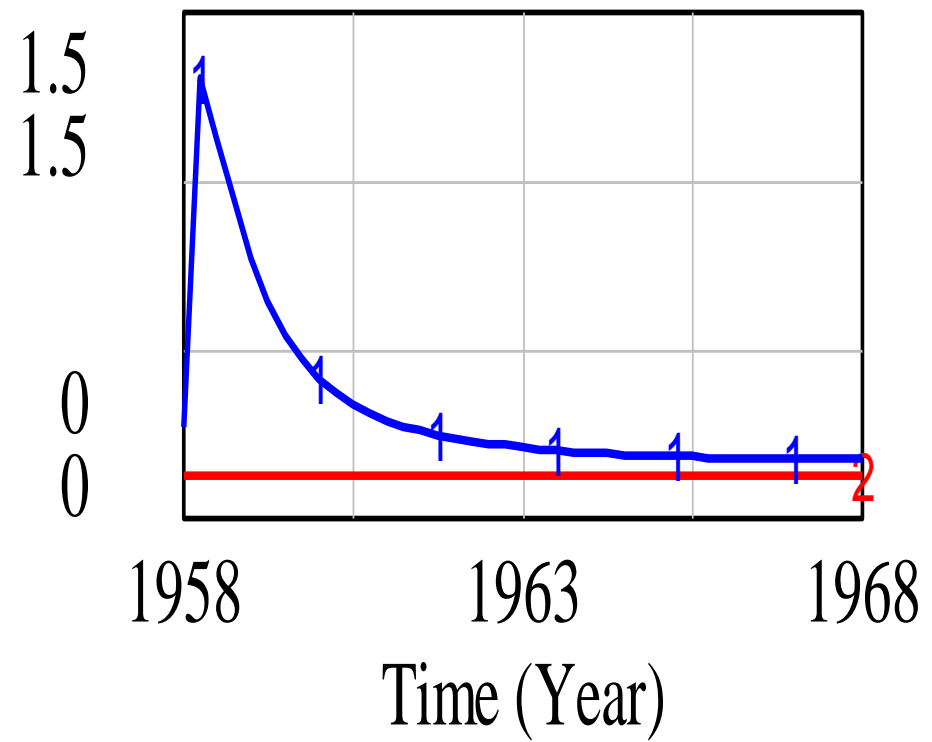
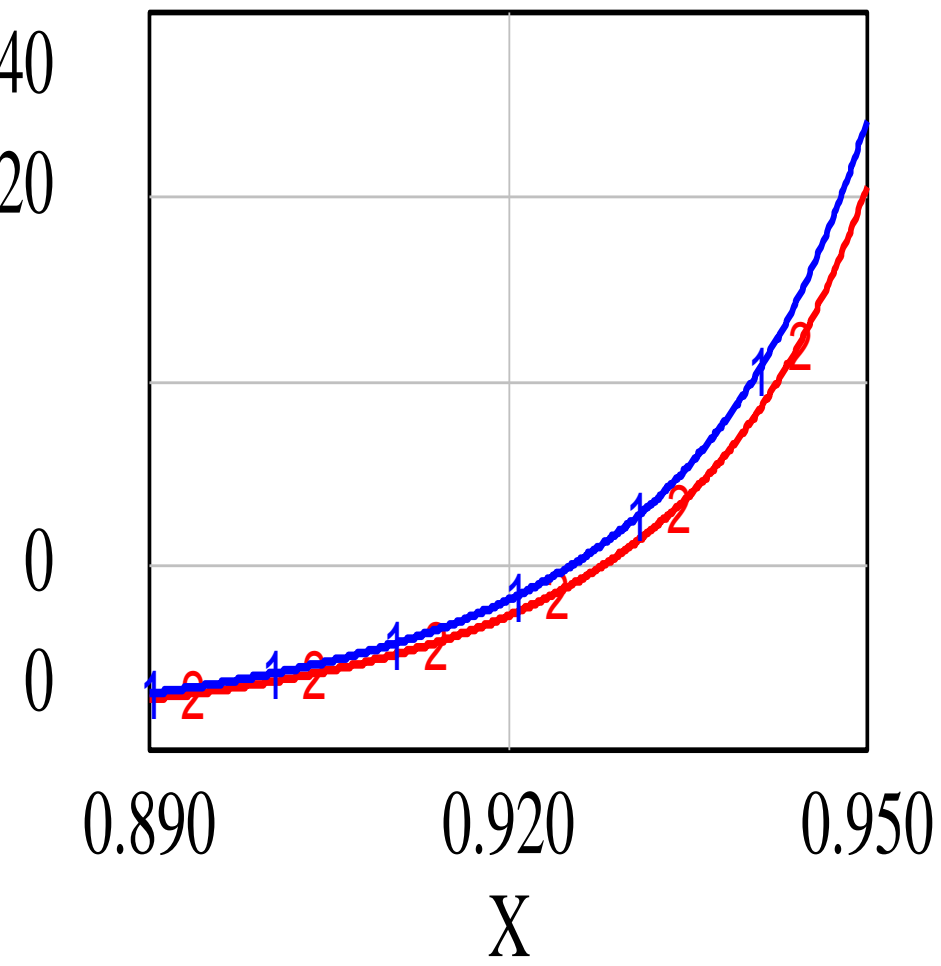
Employment l and net output q in Z-1:
 l (1), q (2) on the left,
 their growth rates (1) and (2) on the right



Index of intensity of workers' competition for jobs at stationary state $\psi = f'(v_b)v_b$ as control parameter and accumulation rate z in $Z^{-1}\psi$



Measures of intensity of workers' competition for jobs at stationary state $Abs(J_{vv})$ and $\psi = f'(X)X$; accumulation rate z and z_{goal} in $Z-1\psi$ for $X = 0.95$



Z-1 extended by standard profit sharing (SPS) is Z-2

SPS (mechanistic) is reflected by additional terms in an extended Phillips equation

- GR of wage becomes the sum of bargained and stimulating terms

$$\hat{w} = f(v) + \eta \frac{1-u}{s(u)} - \omega$$

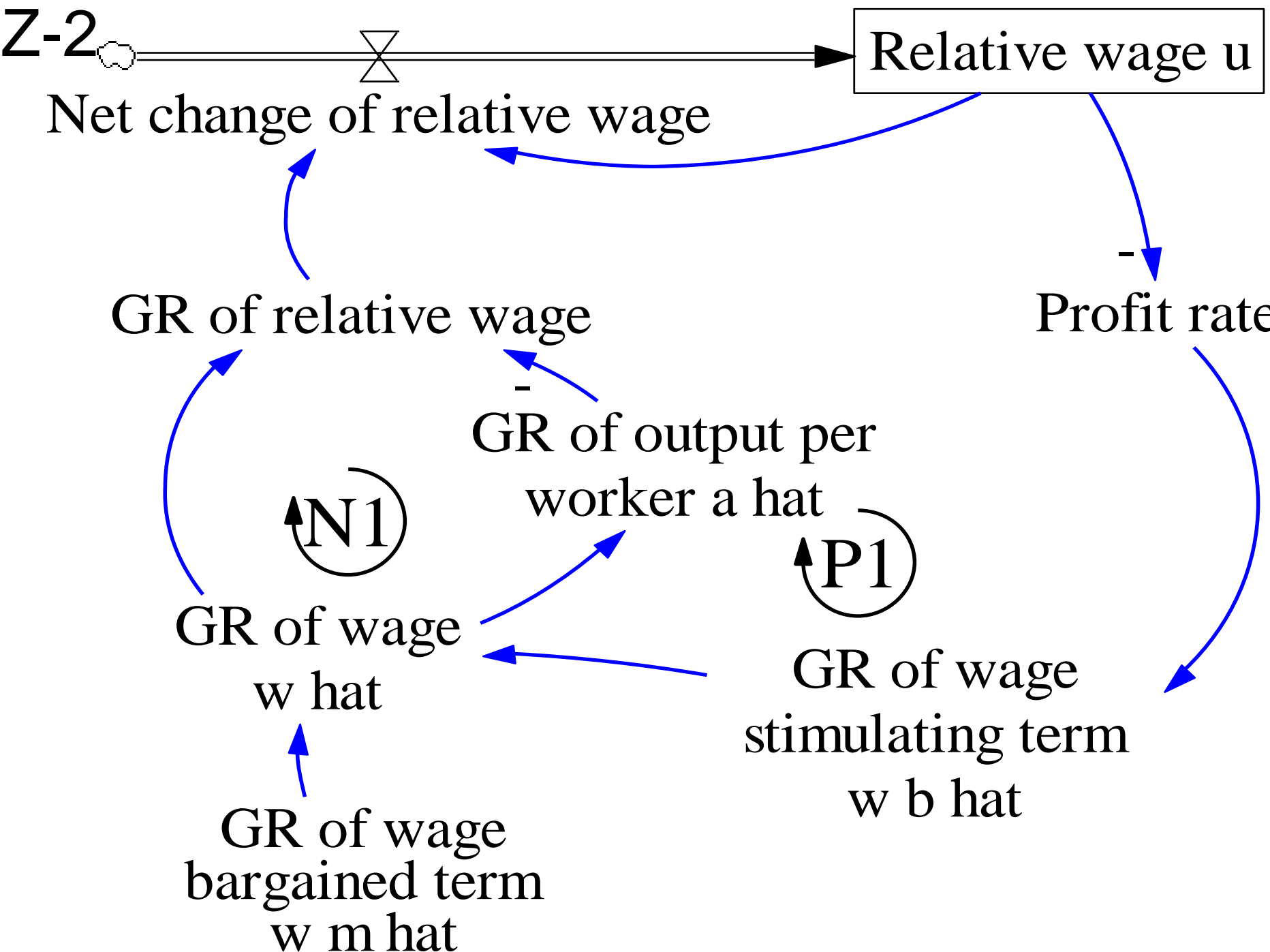
$$\hat{w} = \hat{w}^m + \hat{w}^b$$

Stationary state in Z-2

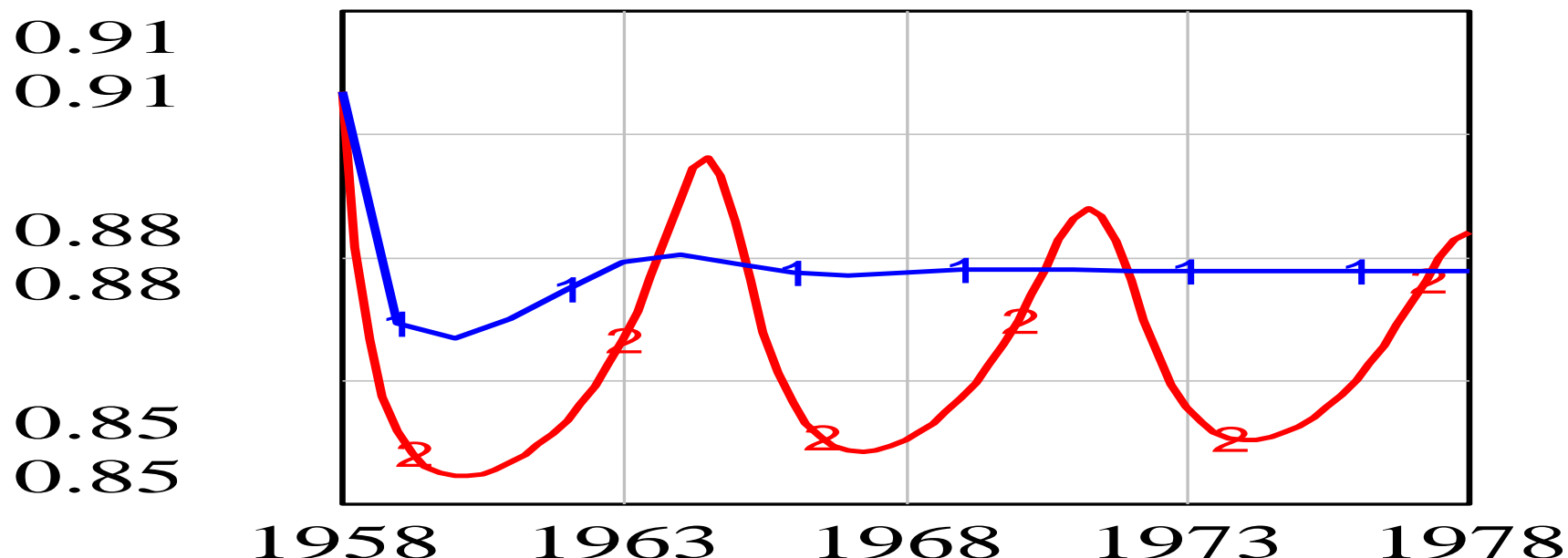
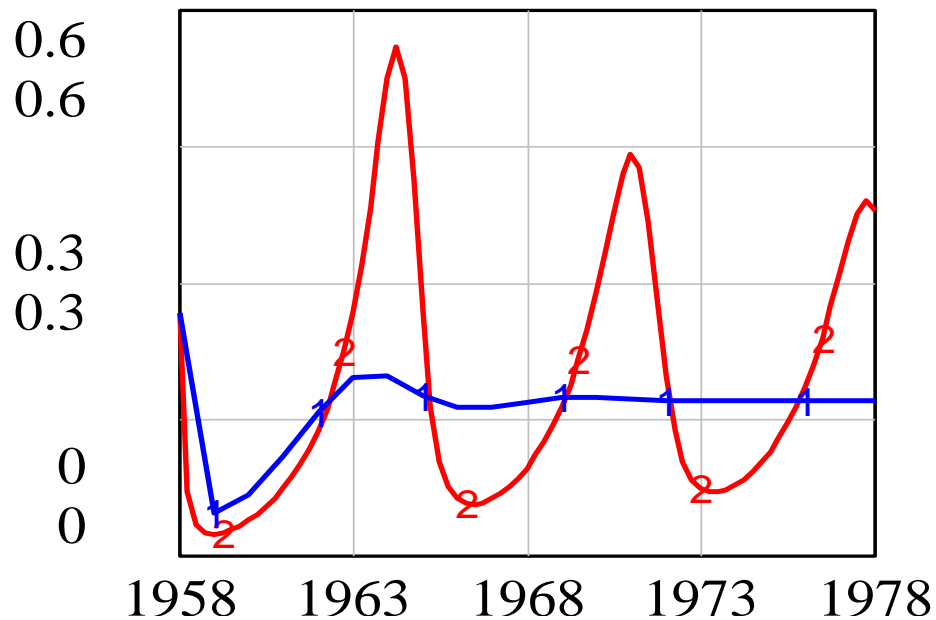
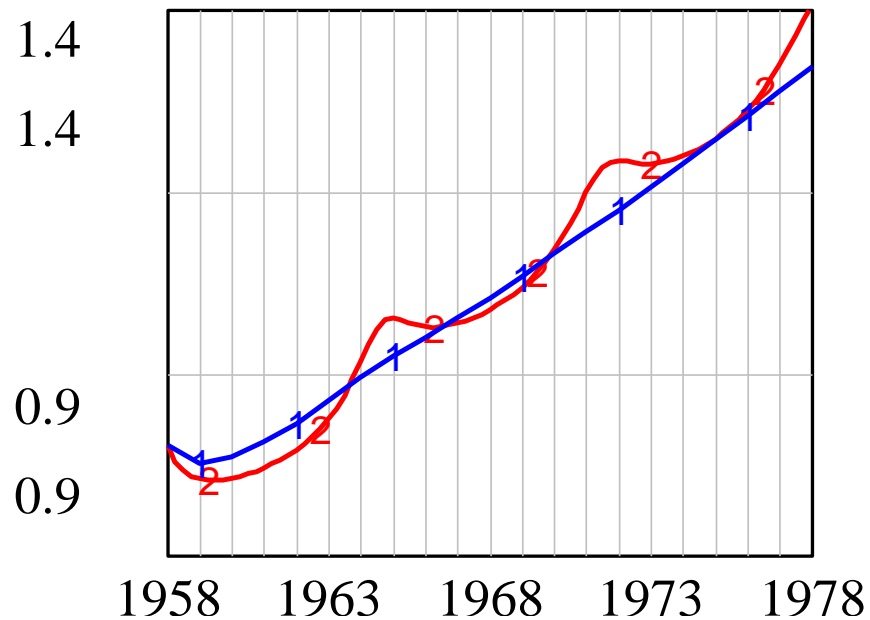
New stationary employment ratio is

$$v_b(\eta, \omega) = f^{-1} \left(\hat{a}_b - \eta \frac{d}{z_b} + \omega \right)$$

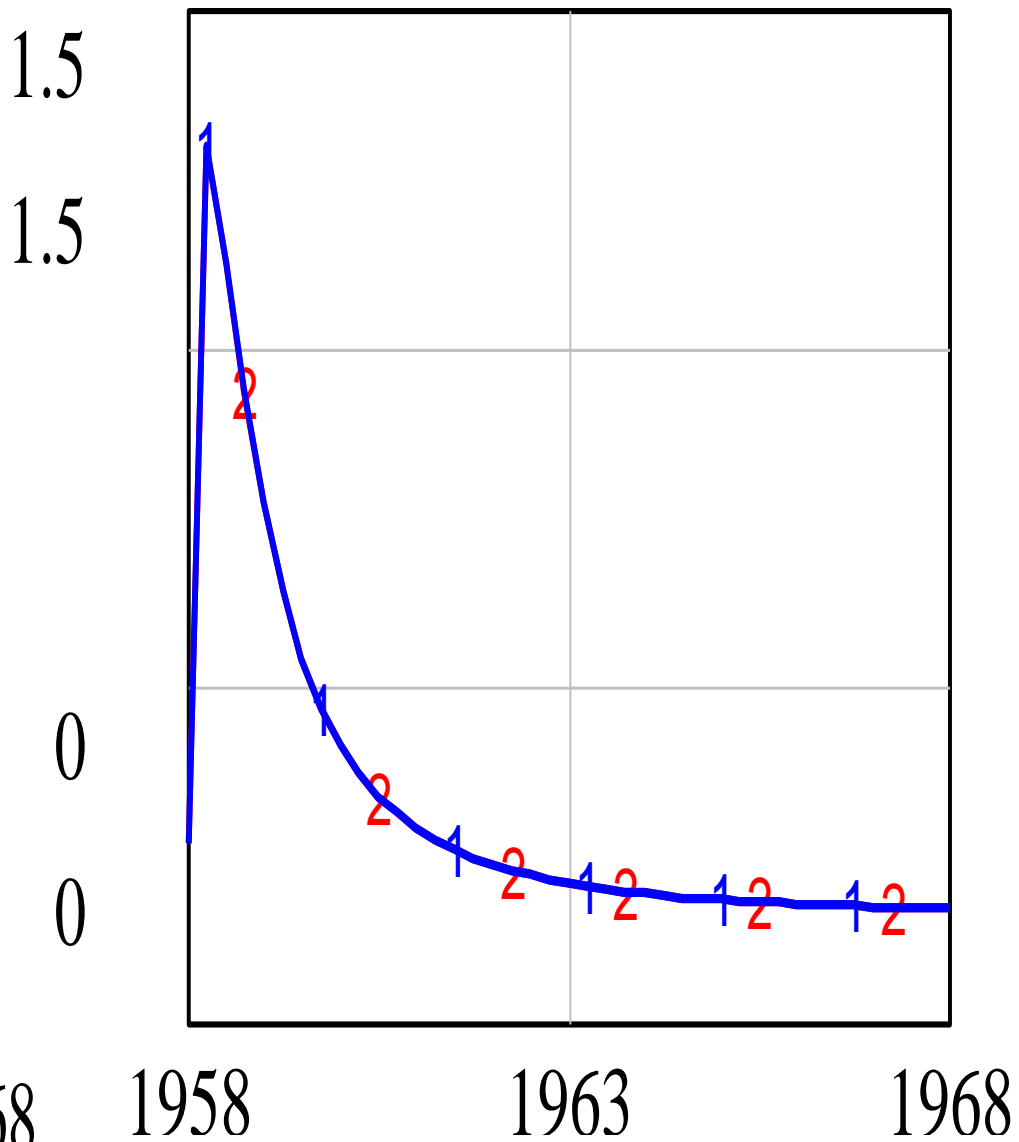
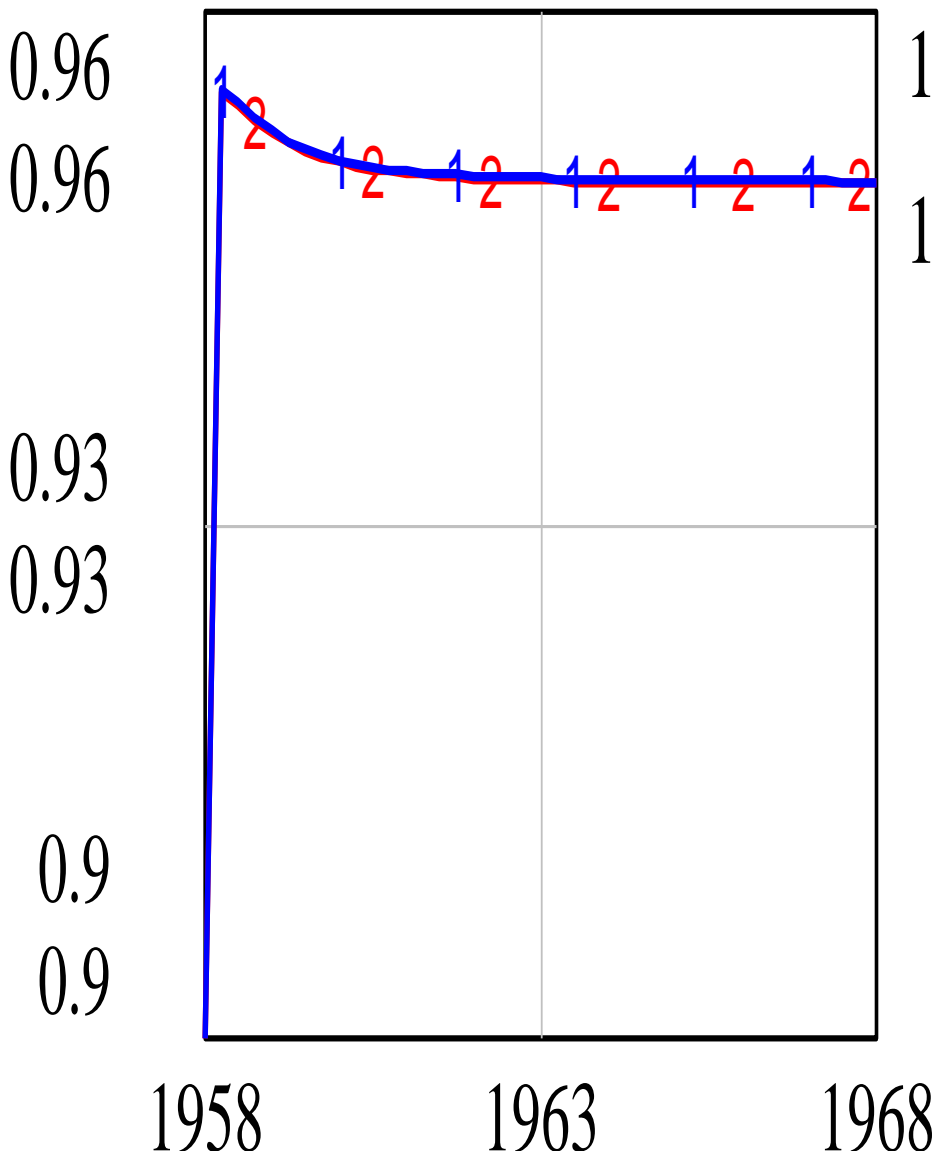
Stationary relative wage u_b , accumulation rate z_b and other stationary magnitudes remain the same as in Z-1.



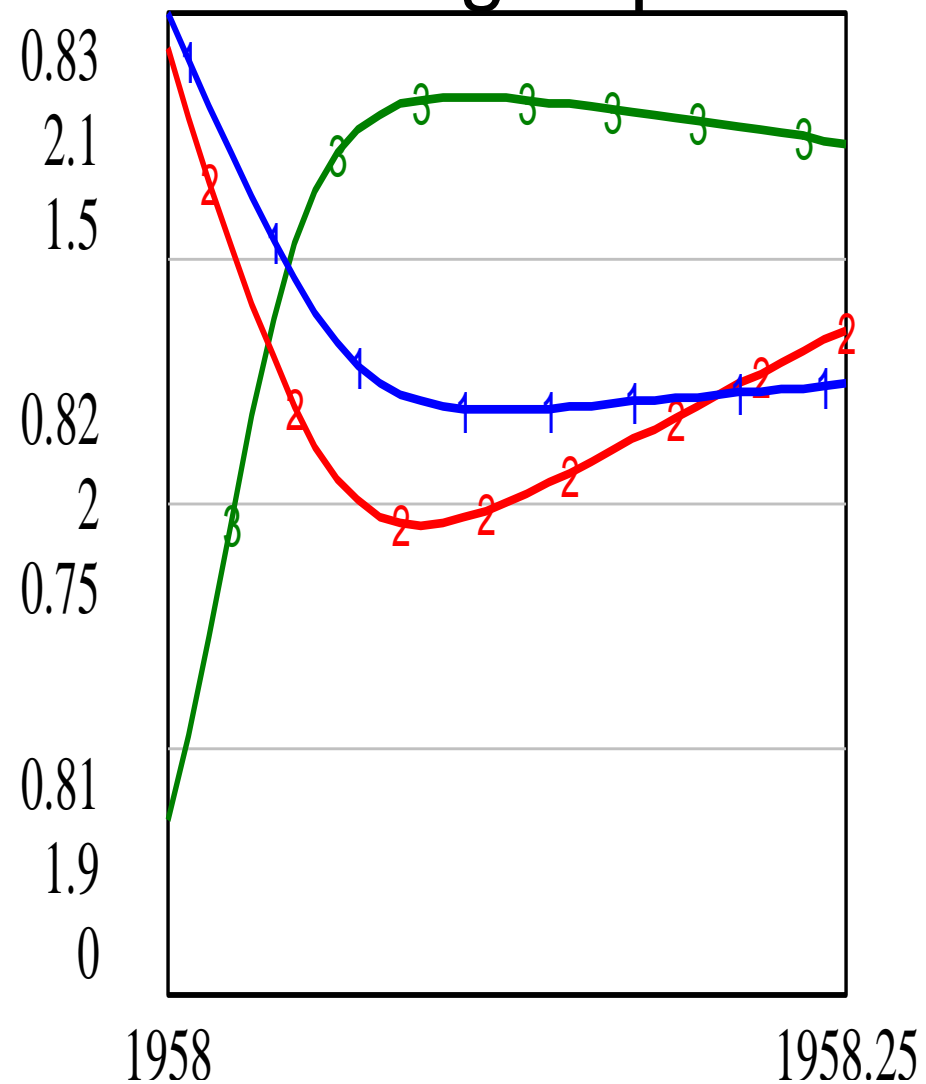
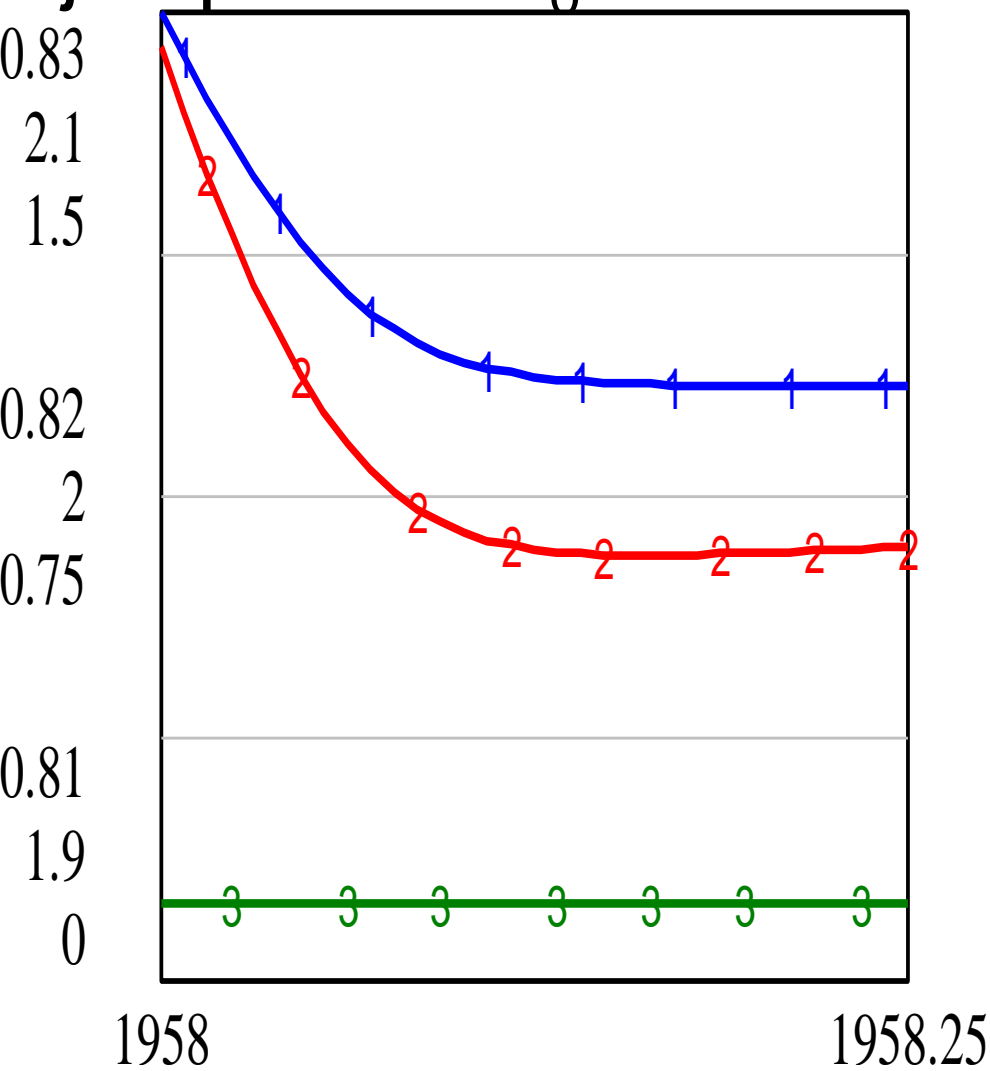
Stabilization of industrial cycles from Z-1 (2) by SPS in Z-2 η (1) for same v_b : P (l.), z (r.), v (c.)



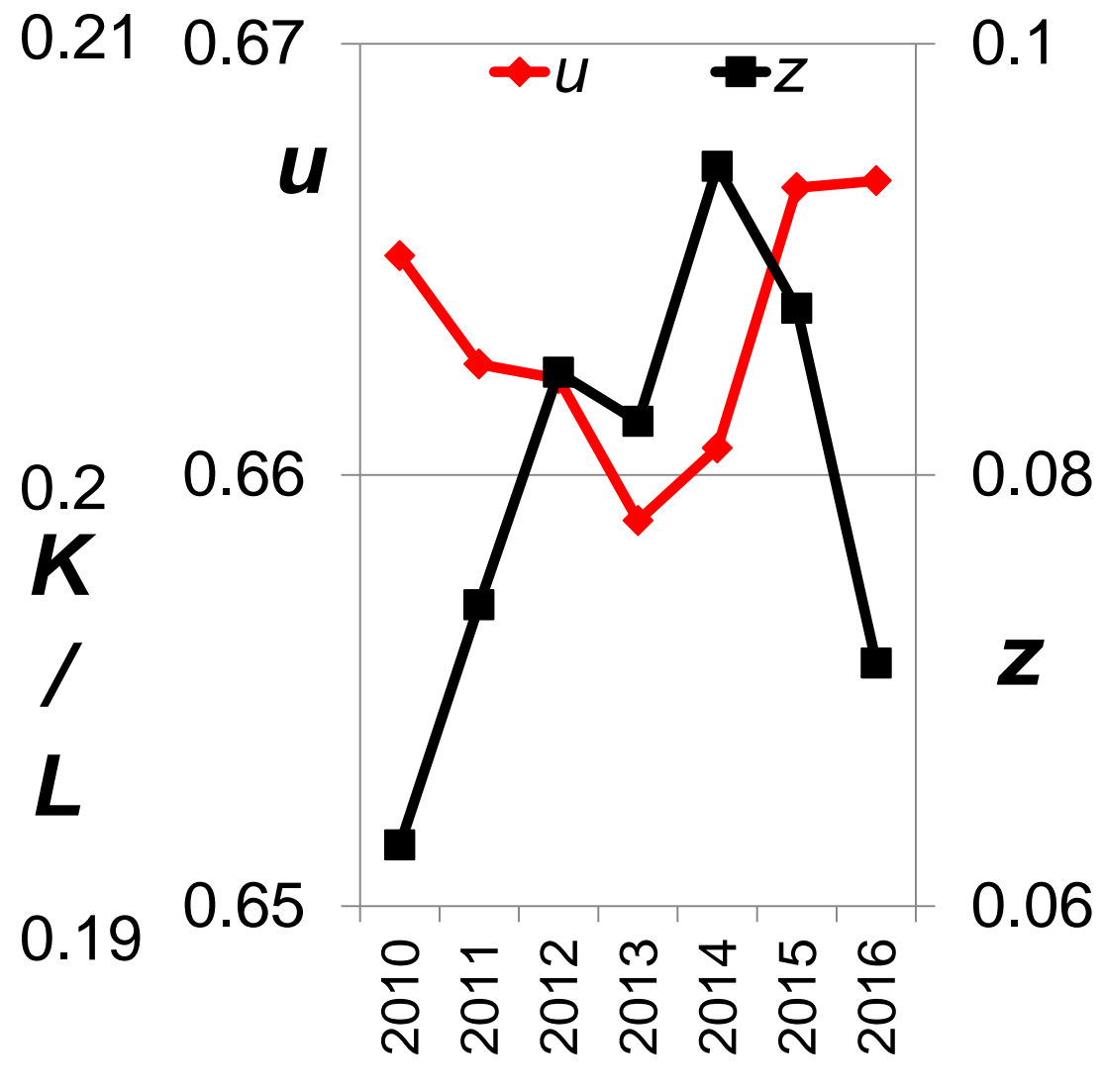
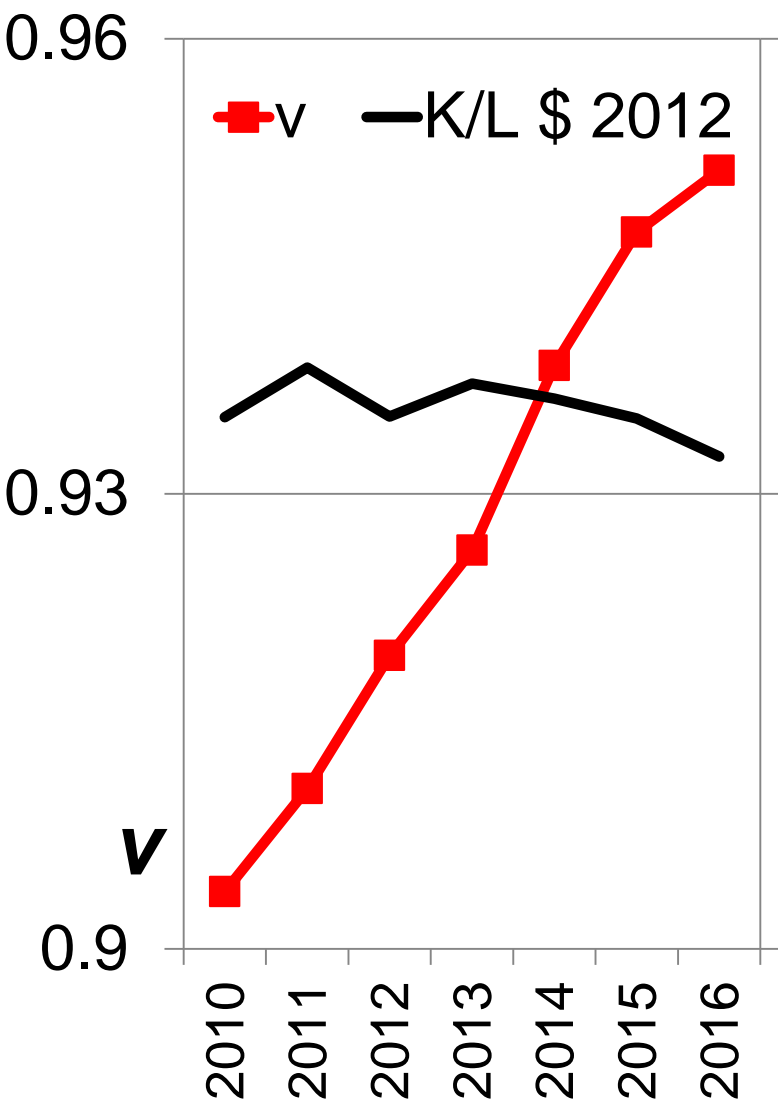
Decorative role of SPS in in $Z-2\eta$ (1) compared with $Z-1\psi$ (2): v (l.), z (r.) in two runs



Super adjustment speed in P-2 (l.) and Z-1 (r.):
 relative wage u (1), capital-output ratio K/L (2),
 accumulation rate z (3) as employment ratio v
 jumps from $v_0 = 0.9$ to $X = 0.95$ during 1 quarter



Employment ratio v and capital intensity K/L (l.), relative wage u and accumulation rate z (r.) in the USA, 2010-2016



Conclusion on stabilisation policies

Model of industrial cycles Z-1 contains strongly non-linear Phillips Eq. that is crucial for dynamics.

Stabilization of industrial cycles can be locally achieved through moderate increases in workers' competition for jobs $\psi = f'(v_b)v_b$. This tool fails for elevated employment target $v = X$ in Z-1 ψ .

SPS with opportunistic targeting of employment ratio stabilizes industrial cycles in Z-2 ω .

SPS fails when employment targeting strives to ambitious goal $v = X$ under improper structural setting. Intensity of workers' competition for jobs is then immensely strengthened in Z-2X as in Z-1 ψ .

Organic profit sharing is recommended solution.

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