Win-lose, Lose-lose and Win-win Stabilization Policies for a Growth Cycle

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Abstract. The Fanti and Manfredi 1998 model (FM) stabilizes growth cycle by profit-sharing, although a long term employment rate declines. The Phillips–Wolfstetter–Flaschel investment function destroys stability of a stationary state in EFM. Adding balanced government taxes and expenditures results in attaining stability again in a 3-dimensional model (extended WFM). Yet stationary labour share (even gross) and employment ratio becomes lower.

This paper revises the preceding equations. The 1st non-linear 3-dimensional model (MM) implements proportional and derivative control over growth rate of profit. This rate depends on a gap between the indicated and current employment ratios and on growth rate of this ratio. The 2nd 4-dimensional decomposable model redefines this combined control applying excess income levy that equals subsidy. Parametric policy optimization in *Vensim* shortens a transient to a target employment ratio without lowering stationary relative wage against the Goodwinian models (FM, WFM).

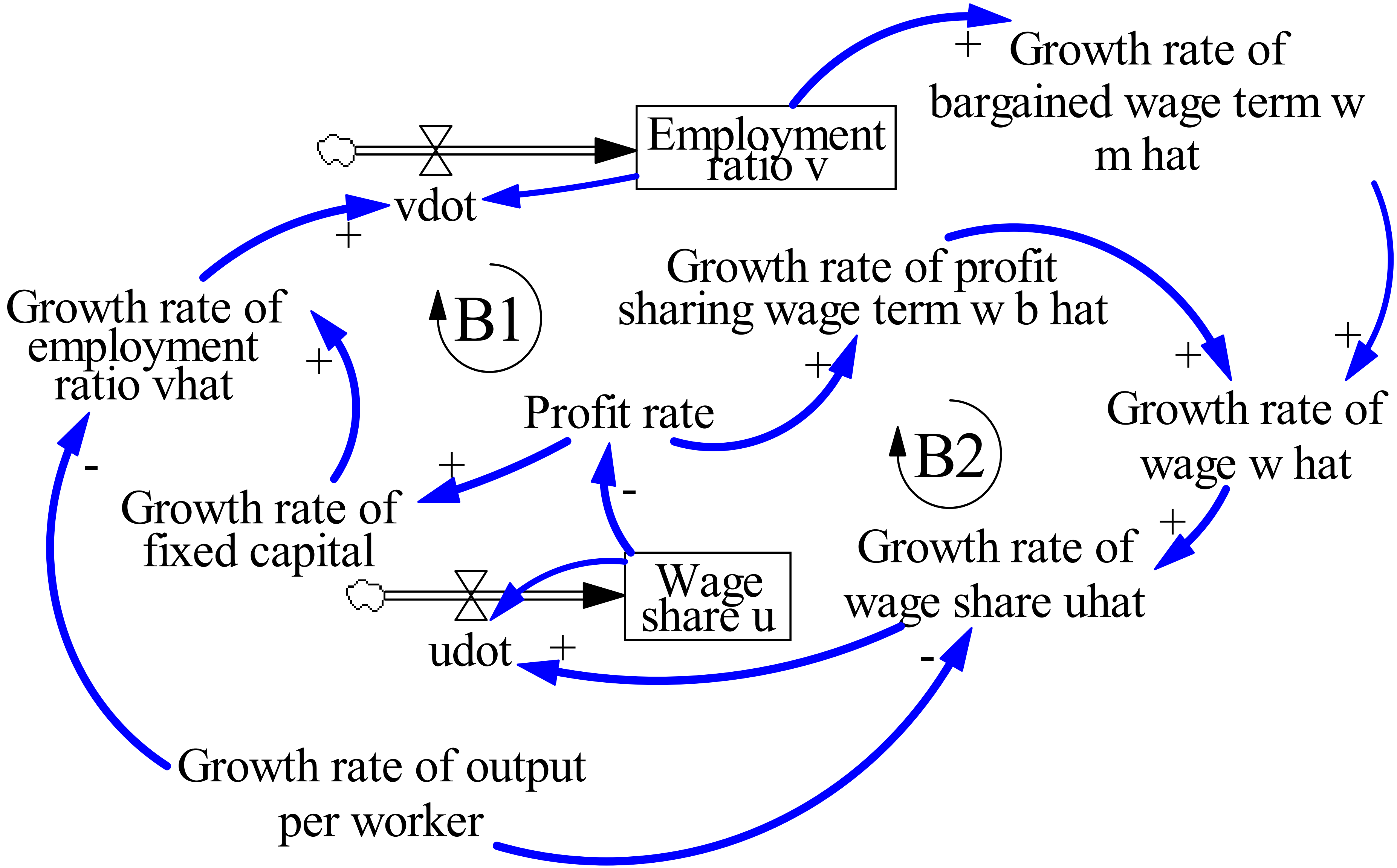
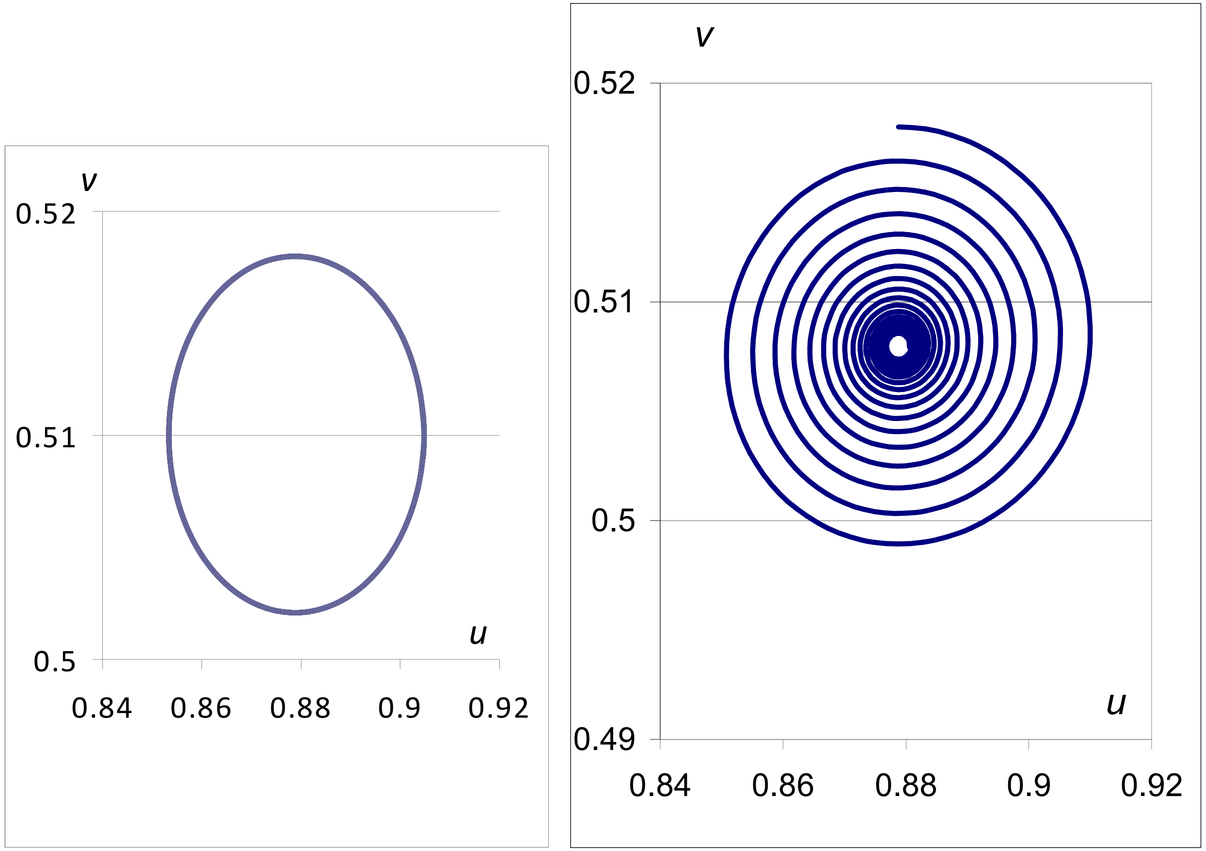


Figure 1.1. A causal structure of FM

Loop B1 (GM)
Wage share u
$\xrightarrow{-}$
Profit rate
Growth rate of fixed capital
Growth rate of employment ratio
Net change of v
Employment ratio v
Growth rate of bargained wage term
Growth rate of wage
Growth rate of wage share
Net change of u

Figure 1.2. Neutral centre in GM (l.), stable focus in FM (r.), clock-wise, 1958–2158; periods: $T_{FM} = 11.57 > T_G = 11.55$ [y.]



Loop B2
Wage share $u \xrightarrow{-}$
Profit rate
Growth rate of profit sharing wage term
Growth rate of wage
Growth rate of wage share
Net change of u

The profit sharing rule does not alter the stationary relative wage u_G inherited from GM. Other stationary magnitudes (ratios and growth rates) also coincide. The long run distribution is left inalterable only in *relative* terms! As the proposed stabilisation policy reduces long run employment ratio v of steady growing labour force N, the employment L, net output P, surplus value S/a, total wage wL, consumption per head wv and profit M are, as a rule, lower that they would be in GM. This policy worsens reproduction and use of economic (first of all – labour) potential in the long term and typically even in the middle term. In particular, the higher profit sharing index e, the lower are the long term and usually even middle term output and employment. This standard profit-sharing is therefore a win-lose stabilization policy.

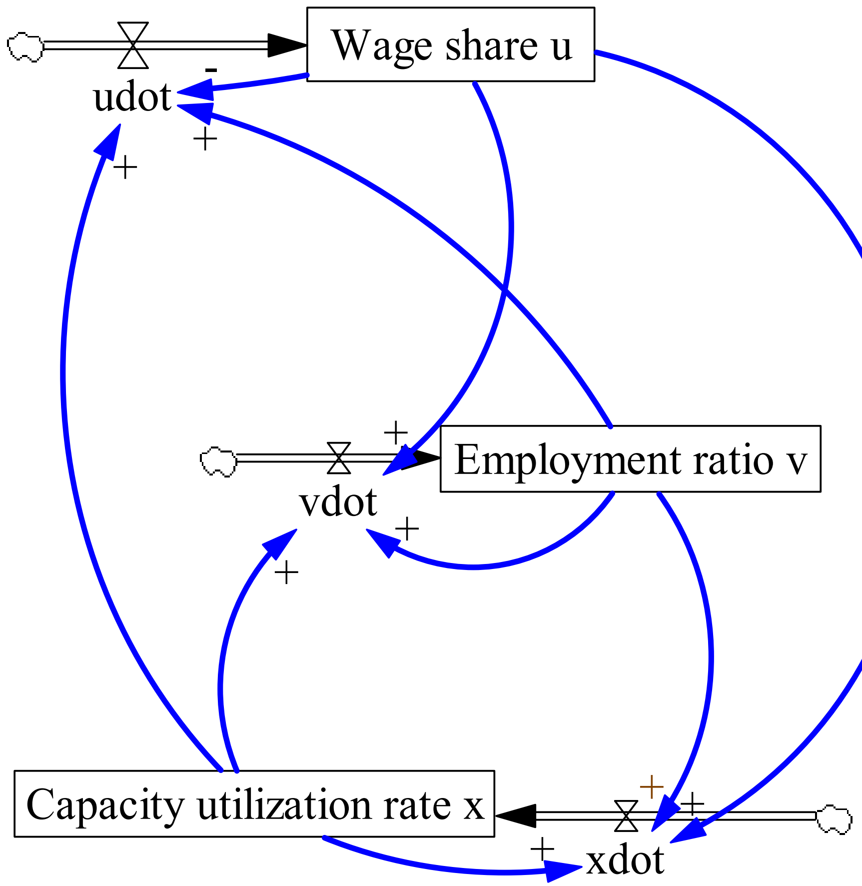
After adding the Phillips–Wolfstetter–Flaschel investment function standard profit-sharing becomes lose-lose policy. Consider a death spiral in a "crash-test".

See Cassidy 2009 and Ryzhenkov 2000 on *rational irrationality* – objectively determined behaviour that, on the individual level, is perfectly reasonable but that, when aggregated in the marketplace, produces calamity.

Firms deem a certain amount of excess capacity as desirable to cash in on demand fluctuations. Two further assumptions: 1) firms are uncertain concerning the deviation of the short-run (γ) from the long-run rate of growth in aggregate demand (d), i.e. the expected value of ($\gamma - d$) is zero; 2) a simple exponential error adjustment process with finite speed of response, ε. Because of the existence of a steady state solution, d equals the natural rate of economic growth, $\gamma_n = d$, then the following differential Eq. defines the proposed investment function (Wolfstetter 1982, Flaschel 2009):

$$\dot{\hat{K}} = \varepsilon(d - \hat{K} - 1 + x) = km[\dot{x}(1-u) - x\dot{u}], \qquad (1.15)$$

where the growth rate of fixed capital is $\hat{K} = k(1-u)mx$, $\varepsilon > 0$ is an adjustment parameter, x and $x_a = 1$ denote the actual and the desired degree of capacity utilization; m is output-capital ratio, u – relative wage, the rate of capital accumulation $d/m < k = \text{const} \leq 1$ for $0 < u_a < 1$.

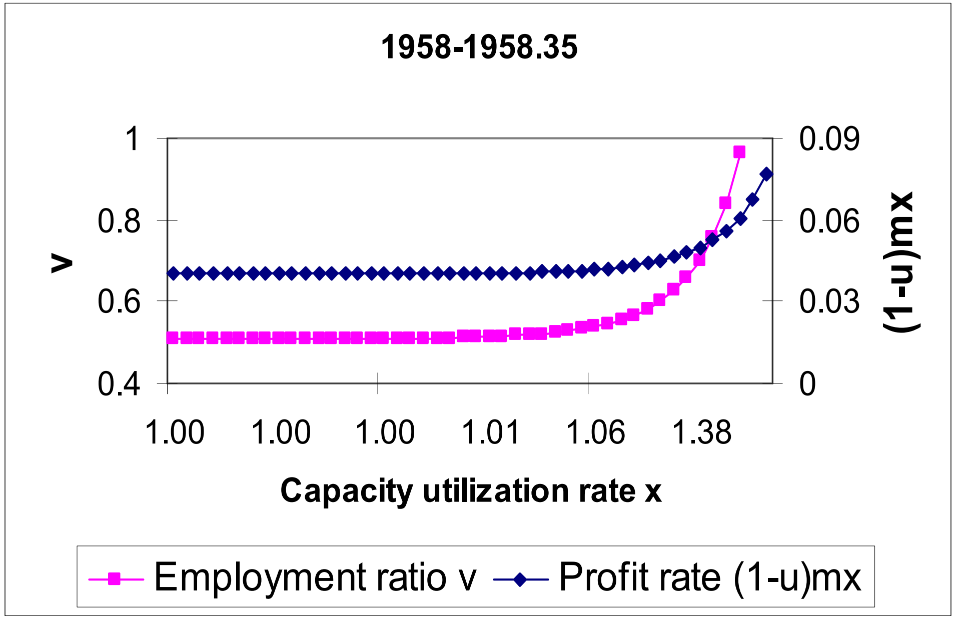


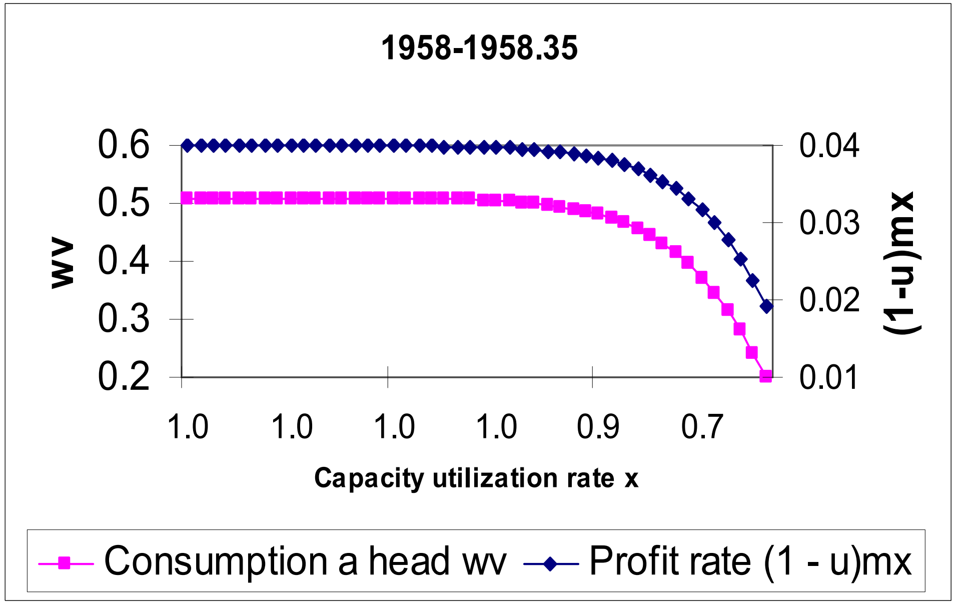
Vereshchagin V. 1871.
Apotheosis of War.
Prophecy on breakdown
(*Zusammenbruch*) in the WWI by
F. Engels in 1887.

Figure 1.3. EFM with polarity at a stationary state; 8 feedback loops: 1st order – 3 (1 – negative, 2 – *positive*), 2nd order – 3 *positive*, 3rd order – 2 *positive*

Profit-sharing becomes *a fix that fails* due to the dominant positive feedback loops that propel the model economy to death.

Uncontrolled strength. Ceiling – full employment $v \approx 0.99$ in 1958.34 for $v_0 = v_a = 0.508$, $u_0 = u_a = 0.879$, $x_0 = x_a + 0.0001 = 1.0001$. Growing profit rate. Cf. Ryzhenkov 2005.	Uncontrolled weakness. Floor – subsistence consumption a head $= 0.4 w_0 v_0$, $x_0 = x_a - 0.0001 = 0.9999$. Declining profit rate. Cf. Engels 1887.





2. Narrowing workers’ profit-sharing by taxes and expenditures

Consider government expenditures G balanced by taxes T depending on the deviation of employment ratio from its stationary magnitude

$$T = \delta_1 P = G = \delta P + \mu(v_{stationary} - v)P, \qquad (2.1)$$

where rather fuzzy still quite plausible bounds may be set as $0.5 \geq \delta_1 \geq 0$, $0.5 \geq \delta \geq 0$, $|\mu| \leq 3$. Bounds for specific values of parameters δ and μ can be determined only with a help of computer simulations.

Table 2.1. A new main first-order feedback loop in WFM

Loop R1 (‘Keynesian’ $\mu > 0$) or B3 (“neoclassical” $\mu < 0$)
Growth rate of employment ratio Net change of v Employment ratio $v \xrightarrow{-}$ for $\mu > 0$ or $\xrightarrow{+}$ for $\mu < 0$ Tax rate $\delta_1 \xrightarrow{-}$ Growth rate of fixed capital

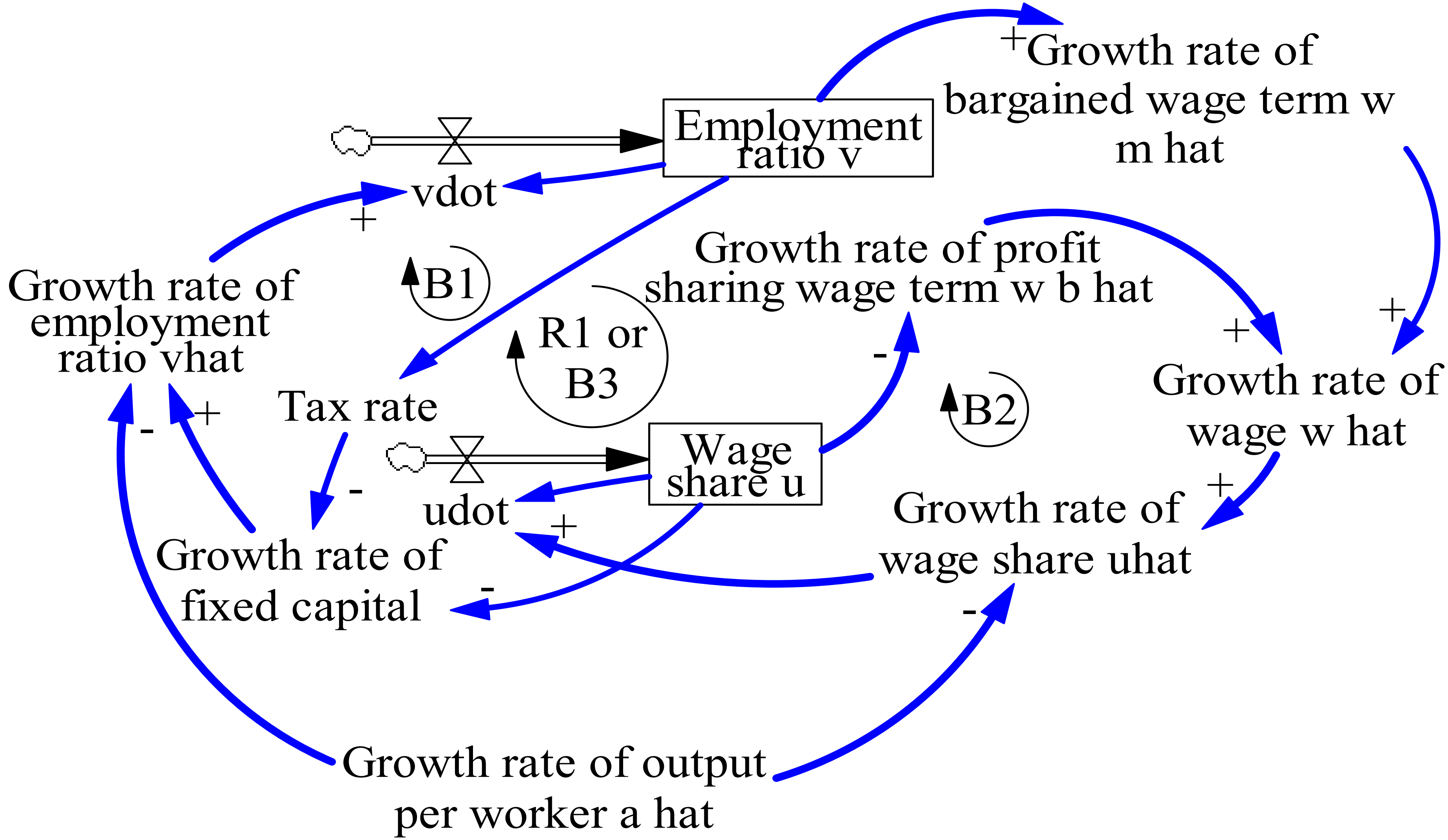


Figure 2.1. A causal structure of WFM
for the normal rate of capacity utilization $x = x_a = 1$

Win-lose policy in WFM:
the stationary employment ratio and relative wage are both below than their counterparts in GM.

The restriction μ < 0 in Eq. (2.1) is necessary and sufficient for stability of a stationary state in my model without profit-sharing (*e* = 0) as in simple models in (Wolfstetter 1982) and (Flaschel 2009).

A successful ‘Keynesian’ stabilization policy is also possible entirely due to profit sharing for $e > 0$ if $0 < \mu < \mu_g$. At $\mu \approx \mu_g$ there is a super-critical Hopf bifurcation.

These policies are not appropriate instruments for solving the problem of dynamic inefficiency of capitalism more fairly and successfully.

2.3. 'Capricious' investment function in extended WFM

The time derivative of the rate of capital accumulation $\dot{c} = -k\dot{\delta}_1 = k\mu\dot{v}$ is directly connected with the time derivative of the employment ratio if $\mu > 0$. For $\mu < 0$, the higher is $\dot{v}$ the lower is $\dot{c}$.

The 'Keynesian' policy with $\mu > 0$ is pro-cyclical (!) with respect to the rate of capital accumulation whereas the 'neoclassical' policy with $\mu < 0$ is counter-cyclical against current view.

It is proved that stability of a stationary state is not amenable to a 'Keynesian' policy even under profit-sharing.

$$\mu_{\text{critical}} = (\delta - 1)/v_b < 0. \qquad (2.16)$$

A policy optimization enabled to find sub-optimal magnitudes of the control parameters: $\mu = -2 < \mu_{\text{critical}} \approx -1.38$, $\delta = 0.3$, $\varepsilon = 1$ for $u_0 = u_b \approx 0.827 > u_{b\ net} \approx 0.579$, $v_0 = 0.518 > v_b \approx 0.507$, $x_0 = 1.2 > x_b = 1$. It is checked that the tax rate ($0.186 \leq \delta_1 \leq 0.356$) lies in the roughly permissible segment [0, 0.5]. The restriction $|\mu| \leq 3$ is also satisfied.

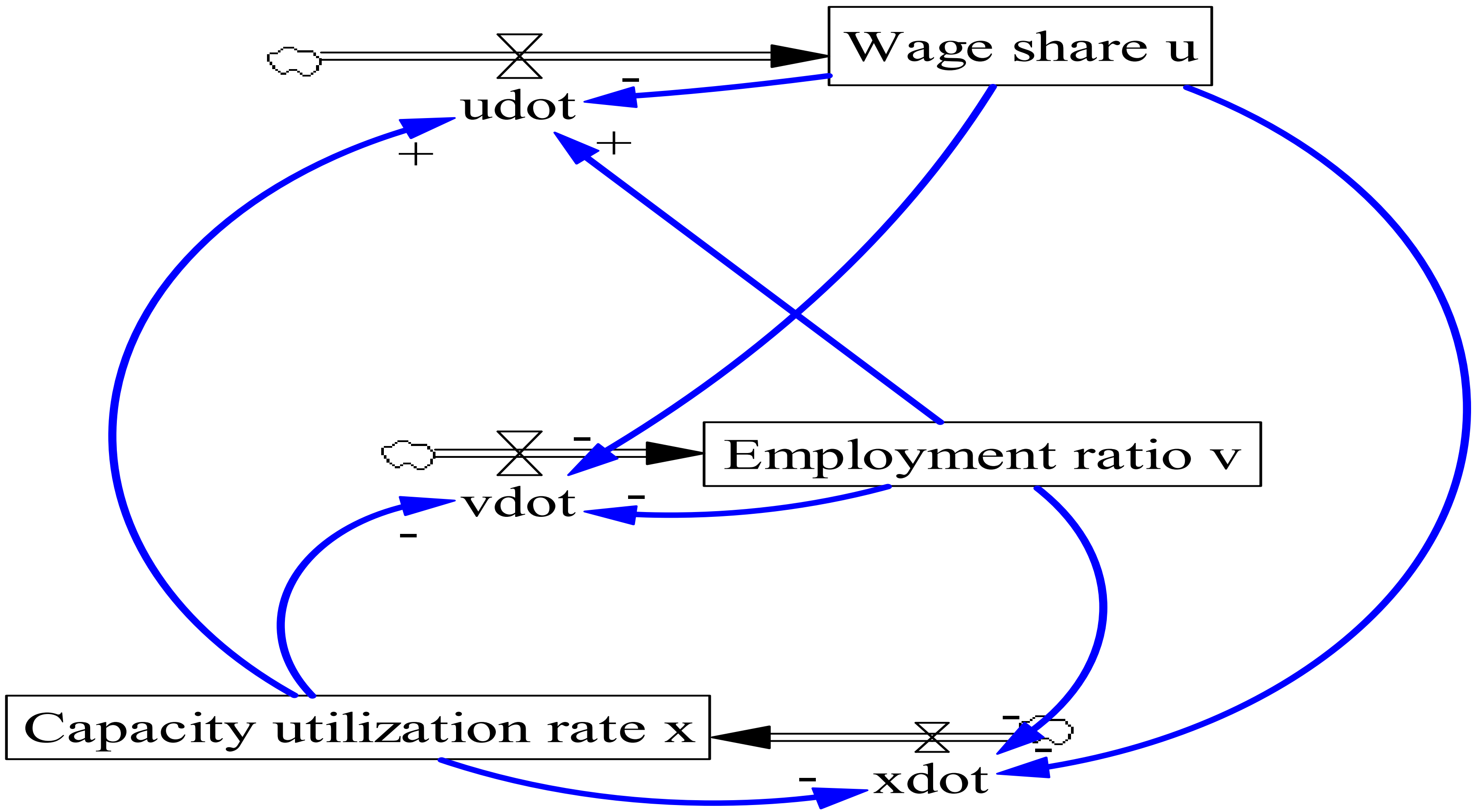


Figure 2.3. A causal loop structure of the extended WFM at a stationary state; 8 feedback loops: 1st order – 3 negative, 2nd order – 3 (2 negative, 1 *positive*), 3rd order – 2 *positive*

3. Employment-centred stabilization of capital accumulation in MM

3 .1. An alternative design of reinforced stabilization policy

Let owners of capital, state officials under pressure of workers' parties and trade-unions set a target growth rate of profit depending on the difference between the indicated (X_1) and current (v) employment ratios (now taking into account the growth rate of capacity utilization $\hat{x}$) in EMM:

$$\hat{M} = -\frac{\dot{u}}{1-u} + \hat{K} + \hat{x} = c_2(X_1 - v), \tag{3.1}$$

where $c_2 > 0$, $v < X_1 = X + d/c_2$, X denotes a target employment ratio, absent in the opponents models, d is a stationary economic growth rate as before. Notice $\hat{x} = 0$ in MM presented first.

A *reinforced* stabilisation policy modifies Eq. (3.1) by adding an element of derivative control ($q > 1$):

$$\hat{M} = c_2(X_1 - v) + (1-q)\hat{v}. \tag{3.2}$$

Table 2.1. Three main negative and one positive feedback loops in MM

Loop B1 of length 8 – 2nd order negative	Loop B2 of length 4 – 1st order negative	Loop B3 of length 6 – 1st order negative	Loop R1of length 4 – 1st order positive
Wage share u $\xrightarrow{-}$ Growth rate of fixed capital Growth rate of employment ratio Net change of v Employment ratio v Growth rate of bargained wage term Growth rate of wage Growth rate of wage share Net change of u	Wage share u $\xrightarrow{-}$ Growth rate of profit sharing wage term Growth rate of wage Growth rate of wage share Net change of u	Wage share u $\xrightarrow{-}$ Growth rate of fixed capital Growth rate of employment ratio Growth rate of profit sharing wage term Growth rate of wage Growth rate of wage share Net change of u	Wage share u Growth rate of bargained wage term Growth rate of wage Growth rate of wage share Net change of u

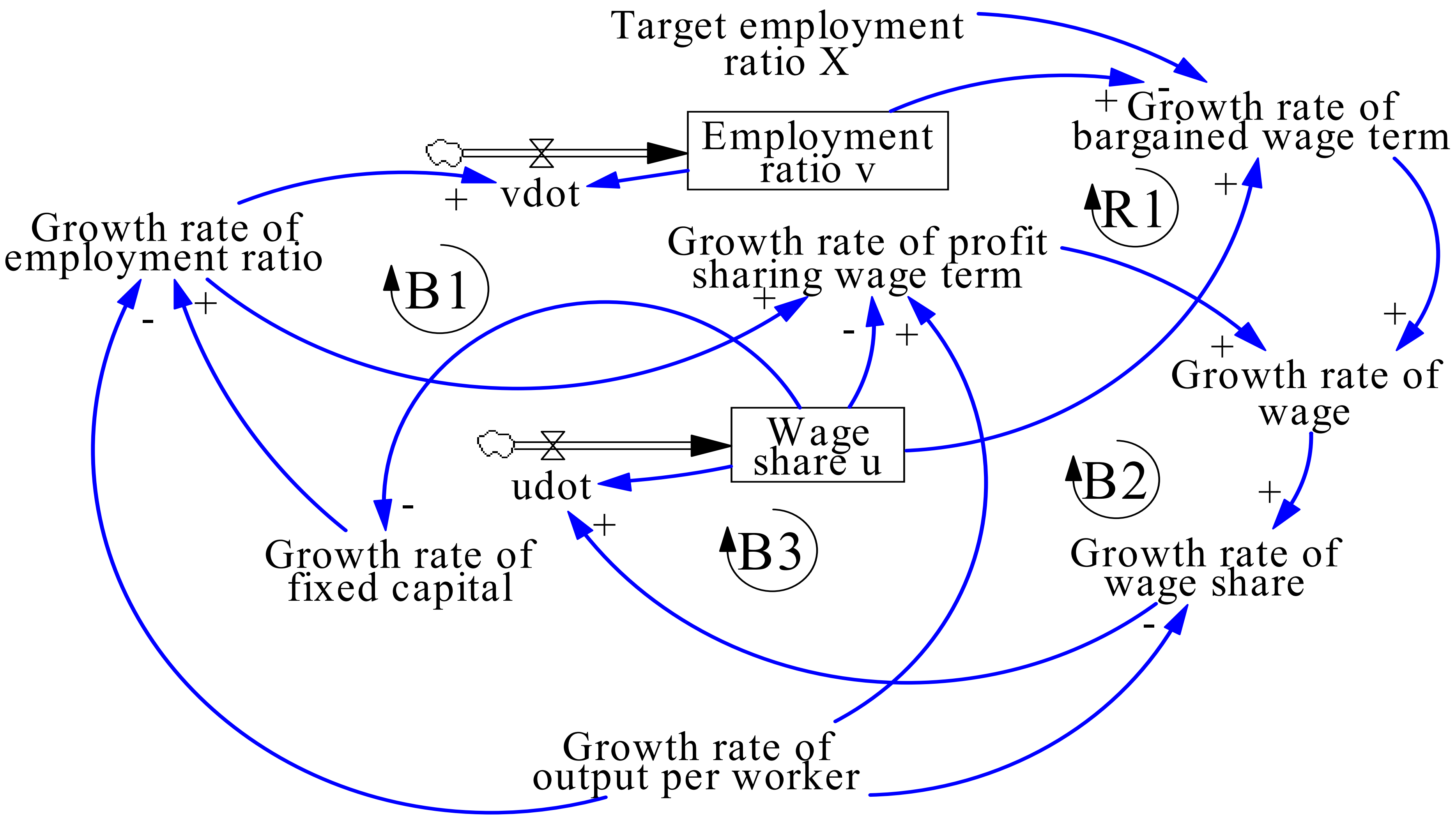


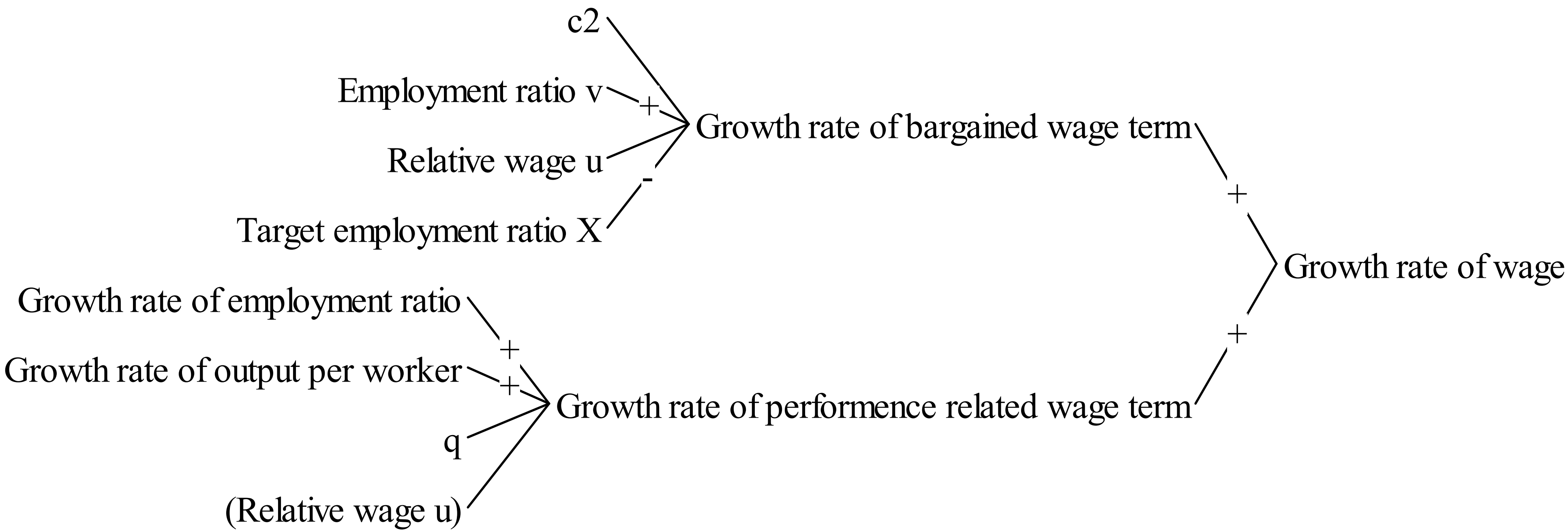
Figure 2.1. A causal loop diagram for MM

The growth rate of capacity utilization in extended MM is defined as

$$\dot{x} = \frac{c_2(v - X) + q(\hat{K} - d)}{1 - q}\, x + \frac{\varepsilon}{(1-u)(1-q)km}(d - \hat{K} + x - 1), \quad (3.5)$$

where growth rate of fixed capital is $\hat{K} = k(1-u)mx$.

Causes tree for growth rate of wage of depth 2 in extended MM:



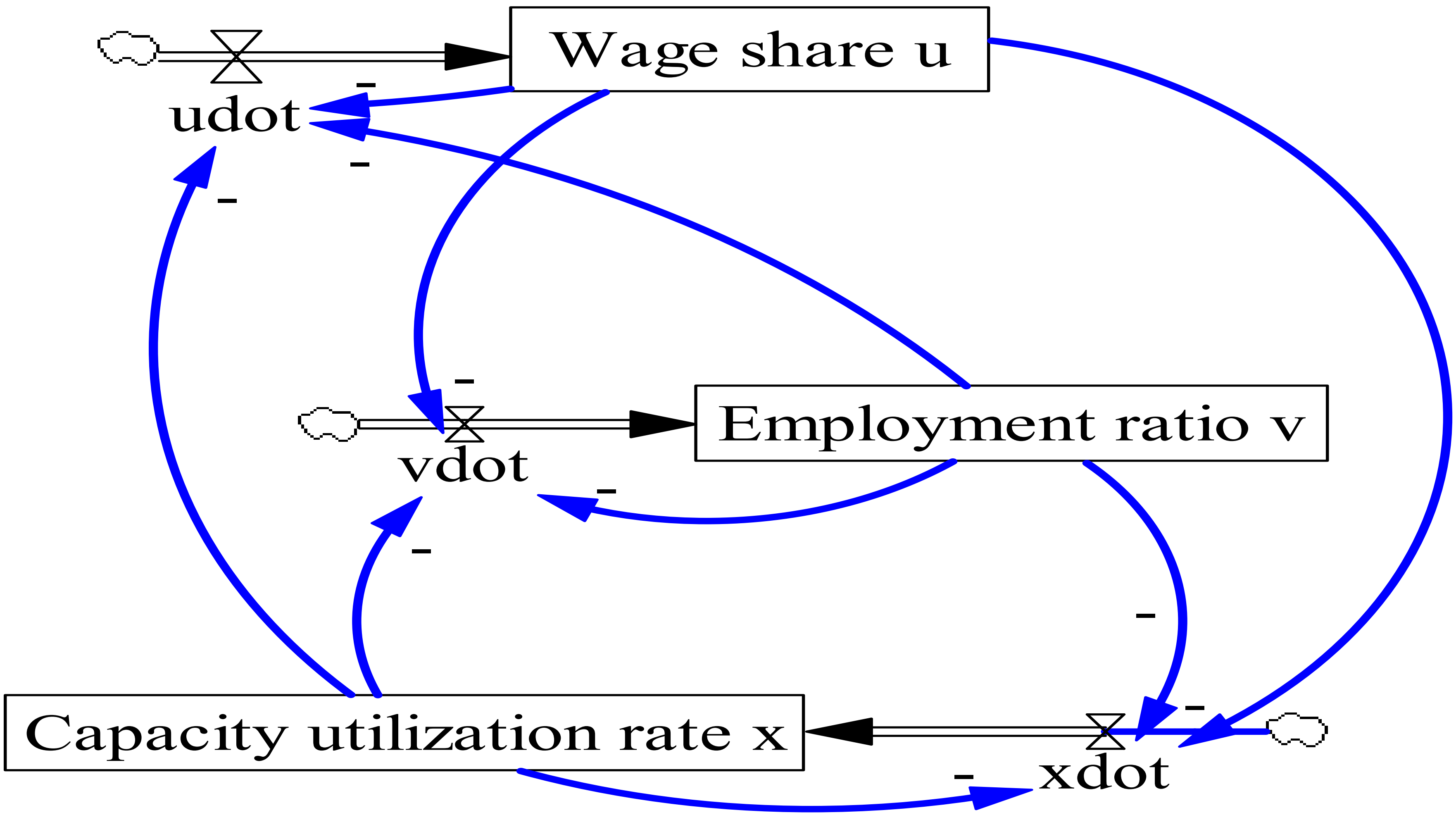
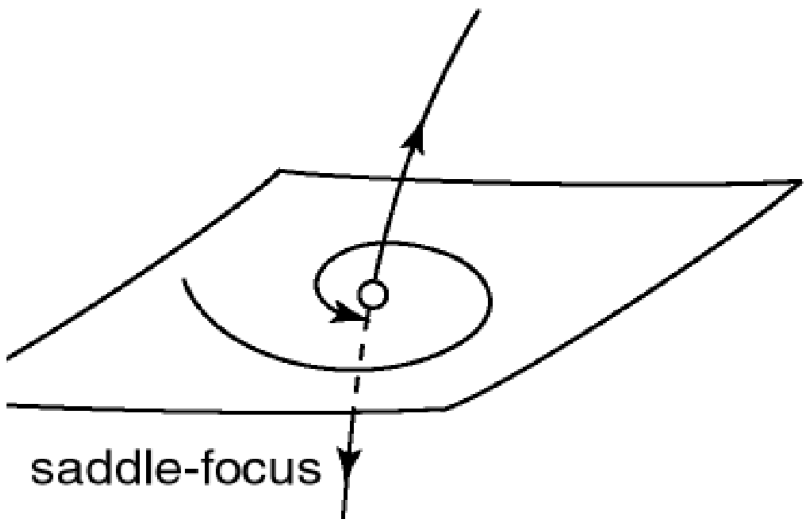
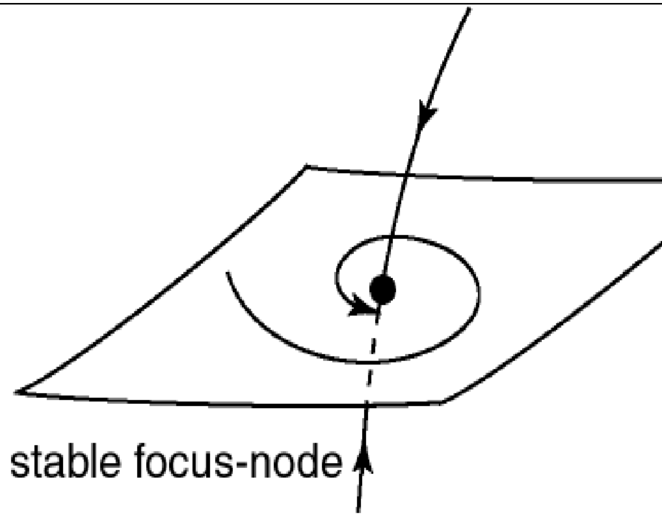


Figure 3.1. A condensed causal loop structure of EMM near a stationary state; 8 feedback loops: 1st order – 3 negative, 2nd order – 3 positive, 3rd order – 2 negative

Table 2.2. Roots of characteristic equations and properties of stationary states

Model	λ_1	$\mathrm{Re}(\lambda_2, \lambda_3)$	$\mathrm{Im}(\lambda_2, \lambda_3)$	Stationary state
Extended Fanti & Manfredi model (EFM)	26.82	–0.125	±0.452	Saddle-focus - unstable
Extended Wolfstetter-Fanti & Manfredi model WFM	–67.33	–0.115	±0.385	Focus-node stable
Extended MM	–10.22	–0.126	±0.106	Focus-node stable

EFM – death spiral	WFM & EMM –"taming of the shrew"
	

The normative Scenario II in EMM uses the sub-optimal magnitudes of the control parameters: $c_2 = 0.882$, $q = 7$ and $\varepsilon = 2$. The employment ratio v moves to target $X = 0.95$ with a very moderate over-shoot whereby $v_{max} = 0.953 < 1$. Profit and other indicators in EMM are generally superior to those in inertia Scenario I in extended WFM with its sub-optimal $\delta = 0.3$, $\mu = -2$ and $\varepsilon = 1$ for the same initial conditions (Figure 3.2).

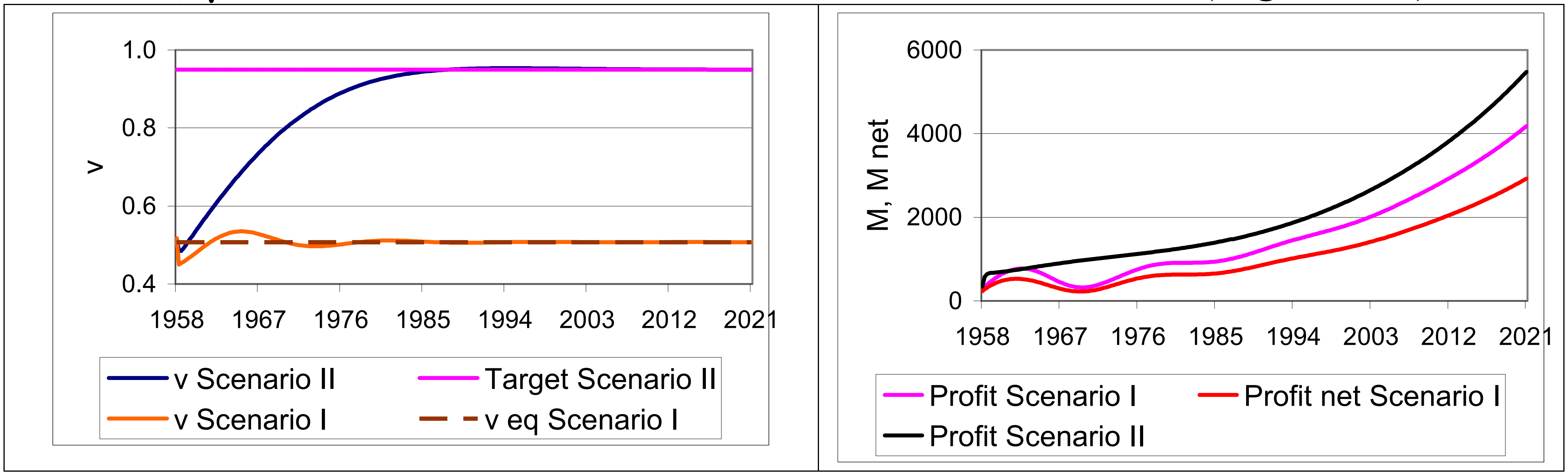


Figure 3.2. Dynamics in extended WFM and EMM: on the left – employment ratio v, on the right – profit M and net profit $M(1-\delta_1)$

3.2 Maintaining capital accumulation and employment through excess income levy – equivalent form of reinforced stabilization policy in MM

The counter-part of excess labour compensation levy T_w is subsidy S_p on pre-levy primary profit. In the opposite case, excess profit levy equals subsidy on labour compensation receivable. It is the state that can levy surcharges on excessive income and pay equivalent subsidy. The state plays here the Maxwell Demon's role.

Let w_{pt} is the pre-levy labour compensation taken as the levy base:

$$w_{pt} = w \frac{1 + \hat{w}_{pt} \cdot 1[\text{year}]}{1 + \hat{w} \cdot 1[\text{year}]}. \qquad (3.17)$$

Its rate of change $\hat{w}_{pt}$ is determined according to Eq. (3.33) below. The after-levy labour compensation is w. The rate of excess labour compensation levy (as a fraction of unit) is

$$x_w = (\hat{w}_{pt} - \hat{w}) \cdot 1[\text{year}]. \qquad (3.18)$$

Total profit is

$$P-(w_{pt}L-T_w)=P-w_{pt}L+S_p=P-wL. \qquad (3.20)$$

In the process of adaptive adjustment the parameters of the Phillips Eq. are substituted: r_{adj} takes place of r, similarly, g_{adj} – of g, initially (t = 1958) $g_{adj} = g$, $r_{adj} = r$.

For $\eta > 0$

$$\dot r_{adj} = \eta(r_{stat} - r_{adj}), \qquad (3.26)$$

$$\dot g_{adj} = \eta(g_{stat} - g_{adj}). \qquad (3.28)$$

Now in MM similarly to FM

$$\hat w_{pt} = -g_{adj} + r_{adj}v + em(1-u). \qquad (3.33)$$

$$\dot v = [k(1-u)m-d]v, \qquad (1.12)$$

and differently from FM

$$\dot u = (\hat w_{pt} - h - x_w)u. \qquad (3.34)$$

The stationary state $(u_G,\ X,\ g_{stat},\ r_{stat})$ of this decomposable 4-dimensional model (3.26), (3.28), (1.12) and (3.34) is locally asymptotically stable.

There is a rather fast convergence of the growth rate of pre-levy labour compensation $\hat{w}_{pt}$ to the growth rate of post-levy labour compensation $\hat{w}$ as well as a smooth converging of the relative excess labour compensation levy x_w to zero, whereby its average magnitude over 1958–2021 is -0.005 (Figure 3.4, Panels 2 and 4).

The large gain in the employment ratio due to the reinforced stabilization policy is seen on Panel 1, whereas the standard profit-sharing provides a higher relative wage during the transitional period reported on Panel 3.

Absolute over-accumulation of capital, typical for GM, FM, WFM and extended WFM, is eliminated in MM and EMM.

Neglected costs of the pre-market co-operation and co-ordination are to be taken into consideration in a subsequent research.

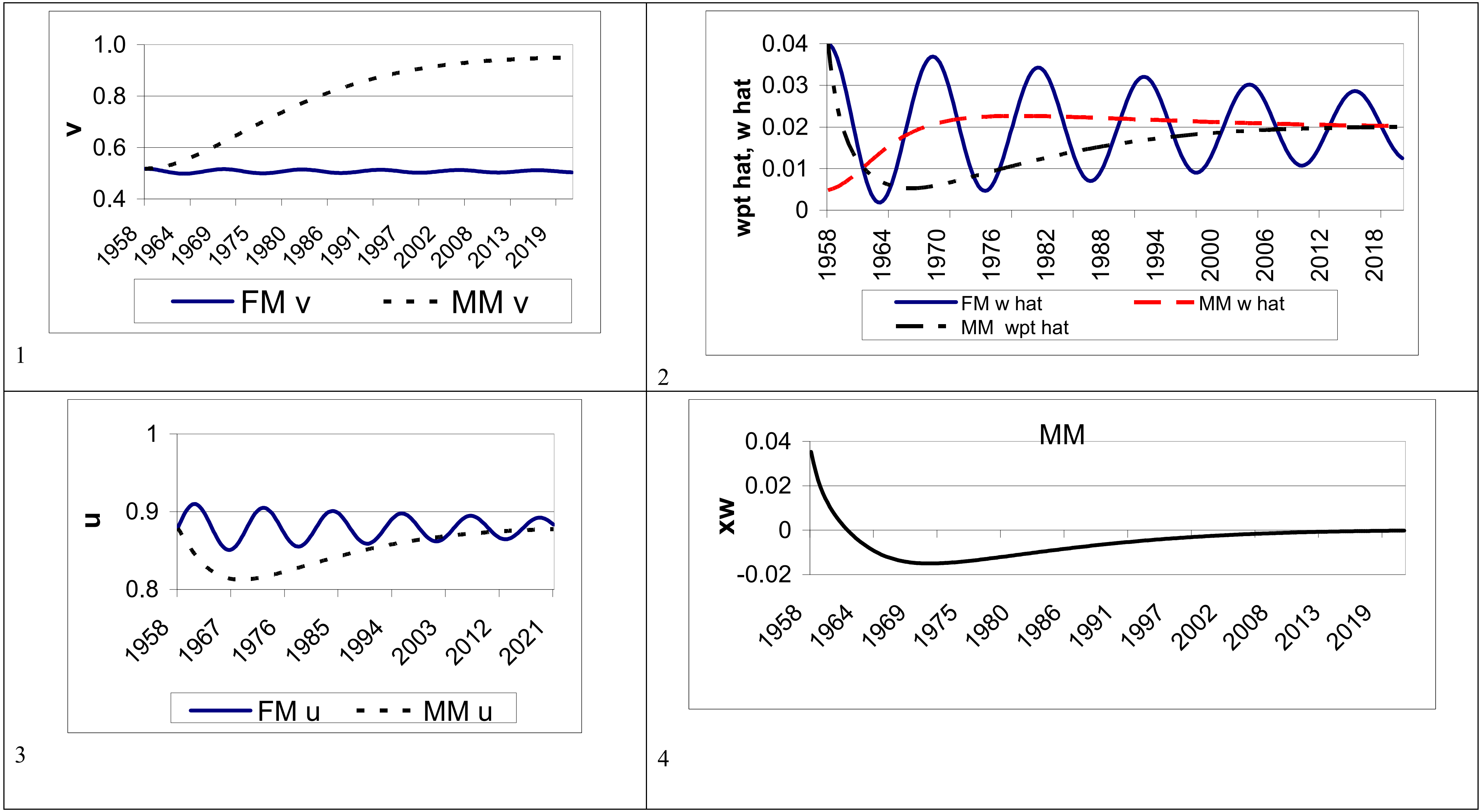


Figure 3.4. Dynamics for the standard profit-sharing in FM and reinforced stabilisation policy in MM

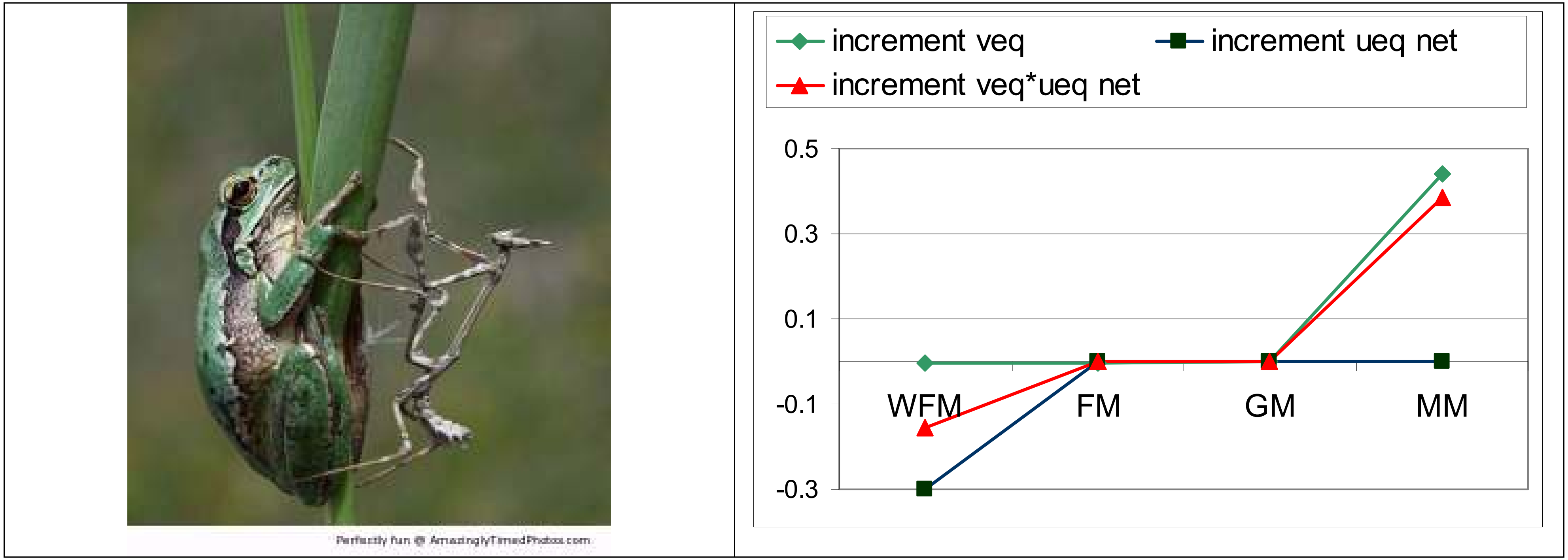


Figure 3.5. Comparison of stationary states in the alternative models FM, WFM, and MM with that in the Goodwin model (GM)

Transforming capitalist mode of production and transiting to socialism will be the increasingly stronger (quite conceivable) alternative if the described inferior win-lose and lose-lose strategies remain dominant.

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