On the self-seeking or altruistic economic policy of the United States with regard to the Rest Of The World and vice versa

An application of a quasi-empirical two-country model

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1: Abstract and Introduction

The central issue in this paper concerns the influence of an altruistic or self-seeking USA policy on the Rest Of The World (ROW).

There are reasons why the USA unilaterally pursues wage, fiscal or monetary policy measures, with negative i.e. ‘beggar-thy-neighbour’ effects on the economic performance of the ROW.

However, the effects may go in the opposite direction too and even can give the ROW a ‘locomotive’ or ‘altruistic’ boost.

Last, but not least, the effects can be of a ‘self-seeking’ kind i.e. beneficial only for the USA, while they are negligible for the ROW.

All these different possibilities have been observed during the last five decades of the past millennium.

In the present paper a ‘neo-classical’ and a ‘neo-keynesian’ quasi-empirical two-country model are used for the analysis of the mutual consequences of a unilaterally induced (negative) wage impulse in country A (for instance in the USA).

(Note that analogue results would be got by postulating a unilaterally induced (positive) labour productivity impulse in country A!)

The short run neo-classical and neo-keynesian model-effects appear to be fundamentally different with each other, but in the long run the two theoretical approaches yield the same results i.e.:

The long-run neo-classical point of view is compatible with the neo-keynesian point of view.

In the long run both points of view tell us that exogenously moderated wages relative to labour productivity growth, unilaterally caused in country A can be qualified as an altruistic economic policy if a regime of fixed exchange rates and imperfect capital mobility is postulated.

(See Cases (II) and (IV) in section 4.) For under this regime, a policy of mitigated wages in country A is quite beneficial, not only for this country but also for country B (ROW).

However, the same unilateral wage policy measure, taken in country A under the regime of flexible exchange rates and imperfect capital mobility appears to be a self-seeking policy because it is extra beneficial for the A country but without any extra output and employment effects for country B. (See Cases (I) and (III) in section 4.)

Probably the latter quasi-empirical cases highly agree with the worldeconomic experience during the mid-nineties of the second millennium.

Since then, USA labour productivity growth accelerated to rates not far below the 2.8 percent of the golden age from 1950 to 1973 (Maddison; 2001).

For 1973-1995 labour productivity grew at 1.4 per cent, and in 1995-1998 at 2.5 percent.

Each of the four models used for this paper can be considered as an ‘exempli gratia’ in order to promote quasi-empirical modelling.

They are simplified versions of the enlarged model presented in Meulendijks (1992). In Meulendijks and Schouten (1995) the main lines of this Dutch-language study are summarized in English.

Besides, in the latter study, the authors explain why for more than twenty years now growing *international* attention has been paid to quasi-empircal modelling for policy analysis.

2: The Symmetric two-country model

The basic version of the models to be applied in the following section consists of over a hundred equations and endogenous variables and, as said before, has been evolved in Meulendijks's Dutch-language study (1992).

The symmetric models are at present significantly reduced by the use of a simple liquidity preference function.

The theoretical basis of the models "links more closely to a mix of Meade's traditional capital-immobility and Mundell-Flemings's perfect capital mobility approaches as wel as to Brainard-Tobin's portfolio/*q*-investment approach.

Moreover, Miller-Salmon's idea of the Stackelberg leader framework to model the interaction of economic policies between two countries has been used" (Meulendijks and Schouten, 1995, p.37).

Variables are formulated as deviations from a trend.

This trend should not be considered as being a random average path of the economy in the period under investigation.

On the contrary, the initial situation of the trend obeys the rules of real and monetary growth theory.

In the present models the case of a positive steady-state growth is postulated ($g_N = 3\frac{1}{3}\%$).

Using the latter situation as a point of reference, the models at hand differ with to what is common in the international literature.

Before engaging in a short discussion of some theoretical characteristics of the models at hand, a few additional remarks are in order.

The closed two-country-model can symmetrically be split up into the country A model and the country B model.

Wage impulses and effects are measured in percentages as deviations from a steady-state equilibrium.

'Balance-variables' are measured in percentage-terms of equilibrium gross value-added in enterprises at equilibrium market prices (GVAE).

Upper case letters usually denote nominal values, lower case letters denote volumes, prices and other variables.

The following definitions are important for understanding the meaning of the variables in the models:

actual absolute value

The following definitions are important for

absolute value on steady trend path

$x = 100.(\hat{x} - \hat{x}_o) / \hat{x}_o =$ percentage of the cumulated extra rate of growth

$\dot{x}$ = actual rate of growth

$\dot{x}_o$ = trend rate of growth

$x = (x - x_{-1}) \approx \dot{x} - \dot{x}_o$ = extra rate of growth

xa= A-country variable x

xb= B-country variable x

Aggregating the symmetric two-country models delivers the closed model of a world economy i.e. x = ½ xa + ½ xb etc.

Other symbols used are explained in the next two sections.

3. Some theoretical characteristics of the models

The main postulates and definitions of the closed model are:

(1)Private consumption (c) is determined by labour income earned in enterprises *(l + w).* Rational tax-policy measures are keeping the public sector financial deficit on a zero level.

$$c = l + w$$

(2)Real wage and salary bill per worker in enterprises $w = (p_l - p)$ are determined by the rate of employment *(l = y)* and an autonomous wage term (plau-impulse), which represents the influence of wage policy adopted by the labour market parties

$w = ½\, y + plau$ (In case of the (N)eo-(C)lassical (M)odel)

$w = ½\, y_{-1} + plau$ (In case of the (N)eo-(K)eynesian (M)odel)

(3) Employment equals real output in enterprises because of a postulated flexible labour supply

$$l = y$$

(4) Gross investment depends on the desired stock of capital goods (k*), yield on the actual stock of capital goods (pr-p) and the real interest rate (r)

$i = k^* + p_r - p - r$ (In case of NCM)

$i = \left(k^* + p_r - p - r\right)_{-1}$ (In case of NKM)

(5) Postulating ‘complementary’ factors of production implies that the desired stock of capital goods equals to real output in enterprises

$$k^* = y$$

(6)Yield on the actual stock of capital goods is by definition

in which = 2/3 is the labour income share (ratio to GVAE)

(7) Terms of trade or (by definition) the difference between the output price and the price of commodities

$P = p_y - p$ (= 0 in case of a closed model)

(8) Price of commodities (expenditure categories)

$$p = -y$$ (In case of NCM)

$$p = \frac{2}{3} w_{-1}$$ (In case of NKM)

(9)Production (= GVAE)

$$y = \frac{2}{3} c + \frac{1}{3} i$$

(10) Production capacity of enterprises

$$y' = k_{-1}$$

(11) Utilization rate of production capacity

$$q = y - y'$$ (= 0 in case of NCM and 0 in case of NKM)

(12) Accumulation of capital goods

$$k = k_{-1} = 0{,}1\left(i - k_{-1}\right)$$

(13) Real interest rate (liquidity preference equation)

$r = 3(y + p + P - M1au)$

[$= 3(y + p - M1au)$ and $p = p_y$ in case of a closed world model]

* Central Bank Policy in a closed world model: *M1au = 0*

- Central Bank Policy in a symmetric two-country model for both countries *: M1au = 0* in case of flexible exchange rates

- and *M1au = P* in case of fixed exchange rates

Explicitely introducing the large and open symmetric two-country models, the aforementioned equations will still hold for the individual countries A and B but some additional equations are coming up too:

(14) Balance on current account at constant prices (percentage of GVAE)

$$s_b^a = -0.5\left(y^a - y^b\right) - \left(p^a - p^b - p_w^a\right) = -s_b^b$$

(15) Balance on current account at current prices (percentage of GVAE)

$$S_b^a = s_b^a + P^a = -S_b^b$$

(16) Terms of trade (percentage of GVAE)

$$P^a = 0.5\left(p^a - p^b - p_w^a\right) = -P^b$$

(17) Nominal exchange rate (PPP-theory does not hold)

$$p_w^a = 0.5\left(p^a - p^b\right) = -p_w^b$$ (In case of flexible exchange rates)

$$p_w^a = -p_w^b = 0$$ (In case of fixed exchange rates)

(18) Balance on capital account (percentage of GVAE)

$$s_k^a = \frac{1}{6}\left(r^a - r^b\right) - p_w^a = -s_k^b$$

in which the p^a_w – variable represents a psychological factor saying that the expected change of the nominal exchange rate $\Delta p^{a*}_w = 0.8\ p^a_w$

(19) Total balance of payments (percentage of GVAE)

$$S_u^a = S_b^a + s_k^a = -S_u^b = 0$$

This relation implicitely states that a surplus or deficit on the capital income account will immediately be neutralized by an equivalent deficit or surplus on the capital account of the balance of payments.

4. The calibrated symmetric two-country models: Four Cases with a unilaterally induced wage impulse in Country A

Case (I): A reduced Neo-Classical Model to demonstrate the Self-Seeking case with Flexible Exchange Rates.

Define some parameters:

Elasticity of a wage change w.r.t. a change of employment:[betac] = .5
Labour income share (ratio to GVAE):[lambda] = .666666
Ratio of imports or exports to GVAE:[mu] = .5
Competitive price elasticity:[eta] = -2
Substitution elasticity with respect to speculative money:[phi] = .333333

Equations:

Private consumption

ca = ka_1 + wa
cb = kb_1 + wb

Gross investment

ia = ka_1 - 2*wa + 3*Pa - ra
ib = kb_1 - 2*wb + 3*Pb - rb

Wage and salary bill per worker in enterprises

wa = [betac]*ka_1 + plaau
wb = [betac]*kb_1 + plbau

Output prices

pa = - ya
pb = - yb

Real interest rate

ra = (1/[phi])*(ya + pa + Pa)
rb = (1/[phi])*(yb + pb + Pb)

Production (Gross value-added in enterprises:GVAE)

ya = [lambda]*ca + (1 - [lambda])*ia + sba
yb = [lambda]*cb + (1 - [lambda])*ib + sbb

Balance on current account at constant prices(percentage of GVAE)

sba = [mu]*(yb - ya) + [mu]*[eta]*(pa - pb - pwa)
sbb = [mu]*(ya - yb) + [mu]*[eta]*(pb - pa - pwb)

Balance on capital account(percentage of GVAE)

ska = 0.5*[phi]*(ra - rb) - 0.5*(pwa - pwb)
skb = 0.5*[phi]*(rb - ra) - 0.5*(pwb - pwa)

Balance on current account at current prices(percentage of GVAE)

Sba = sba + Pa
Sbb = sbb + Pb

Nominal exchange rate

pwa = 0.5*(pa - pb)
pwb = 0.5*(pb - pa)

Production capacity of enterprises

yac = ka_1
ybc = kb_1

Utilization rate of production capacity

qa = ya - yac
qb = yb – ybc

Accumulation of capital goods

ka = ka_1 + 0.1*(ia - ka_1)
kb = kb_1 + 0.1*(ib - kb_1)

Employment in enterprises

la = ya
lb = yb

Terms of trade

Pa = [mu]*(pa - pb - pwa)
Pb = [mu]*(pb - pa - pwb)

Results:

# Time horizon (default is 10 periods)
h=1000
1-9,1000

Impulse for the exogenous variable:

plaau = -1
plbau = 0.0

Res-mod-I 20.37 140801

Note that for every variable its extra rate of growth (first row) as well as its cumulated extra rate of growth (second row) are recorded!

plaau -1.000

Period:	**1**	**2**	**3**	**4**	**5**
ca	-1.000	.300	.270	.243	.219
	-1.000	-.700	-.430	-.187	.032
cb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ia	2.000	.000	.000	.000	.000
	2.000	2.000	2.000	2.000	2.000
ib	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
wa	-1.000	.100	.090	.081	.073
	-1.000	-.900	-.810	-.729	-.656
wb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
pa	.000	-.200	-.180	-.162	-.146
	.000	-.200	-.380	-.542	-.688
pb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ra	.000	-.150	-.135	-.122	-.109
	.000	-.150	-.285	-.407	-.516
rb	.000	.150	.135	.122	.109
	.000	.150	.285	.407	.516
ya	.000	.200	.180	.162	.146
	.000	.200	.380	.542	.688
yb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000

sba	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
sbb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ska	.000	.050	.045	.040	.036
	.000	.050	.095	.136	.172
skb	.000	-.050	-.045	-.040	-.036
	.000	-.050	-.095	-.136	-.172
Sba	.000	-.050	-.045	-.040	-.036
	.000	-.050	-.095	-.136	-.172
Sbb	.000	.050	.045	.040	.036
	.000	.050	.095	.136	.172
pwa	.000	-.100	-.090	-.081	-.073
	.000	-.100	-.190	-.271	-.344
pwb	.000	.100	.090	.081	.073
	.000	.100	.190	.271	.344
yac	.000	.200	.180	.162	.146
	.000	.200	.380	.542	.688
ybc	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
qa	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
qb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ka	.200	.180	.162	.146	.131
	.200	.380	.542	.688	.819

kb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
la	.000	.200	.180	.162	.146
	.000	.200	.380	.542	.688
lb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
Pa	.000	-.050	-.045	-.040	-.036
	.000	-.050	-.095	-.136	-.172
Pb	.000	.050	.045	.040	.036
	.000	.050	.095	.136	.172

Period:	**6**	**7**	**8**	**9**	**122**
ca	.197	.177	.159	.143	.000
	.229	.406	.565	.709	2.000
cb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ia	.000	.000	.000	.000	.000
	2.000	2.000	2.000	2.000	2.000
ib	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
wa	.066	.059	.053	.048	.000
	-.590	-.531	-.478	-.430	.000
wb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
pa	-.131	-.118	-.106	-.096	.000
	-.819	-.937	-1.043	-1.139	-2.000

pb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ra	-.098	-.089	-.080	-.072	.000
	-.614	-.703	-.783	-.854	-1.500
rb	.098	.089	.080	.072	.000
	.614	.703	.783	.854	1.500
ya	.131	.118	.106	.096	.000
	.819	.937	1.043	1.139	2.000
yb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
sba	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
sbb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ska	.033	.030	.027	.024	.000
	.205	.234	.261	.285	.500
skb	-.033	-.030	-.027	-.024	.000
	-.205	-.234	-.261	-.285	-.500
Sba	-.033	-.030	-.027	-.024	.000
	-.205	-.234	-.261	-.285	-.500
Sbb	.033	.030	.027	.024	.000
	.205	.234	.261	.285	.500
pwa	-.066	-.059	-.053	-.048	.000
	-.410	-.469	-.522	-.570	-1.000
pwb	.066	.059	.053	.048	.000
	.410	.469	.522	.570	1.000

yac	.131	.118	.106	.096	.000
	.819	.937	1.043	1.139	2.000
ybc	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
qa	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
qb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ka	.118	.106	.096	.086	.000
	.937	1.043	1.139	1.225	2.000
kb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
la	.131	.118	.106	.096	.000
	.819	.937	1.043	1.139	2.000
lb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
Pa	-.033	-.030	-.027	-.024	.000
	-.205	-.234	-.261	-.285	-.500
Pb	.033	.030	.027	.024	.000
	.205	.234	.261	.285	.500

Case (II): Small Neo-Classical model to demonstrate the Altruistic case with Fixed Exchange Rates.

Define some parameters:

[betac] = .5
[lambda] = .666666
[mu] = .5
[eta] = -2
[phi] = .333333

Equations:

ca = ka_1 + wa
cb = kb_1 + wb
ia = ka_1 - 2*wa + 3*Pa - ra
ib = kb_1 - 2*wb + 3*Pb - rb
wa = [betac]*ka_1 + plaau
wb = [betac]*kb_1 + plbau
pa = - ya
pb = - yb
ra = (1/[phi])*(ya + pa)
rb = (1/[phi])*(yb + pb)
ya = [lambda]*ca + (1 - [lambda])*ia + sba
yb = [lambda]*cb + (1 - [lambda])*ib + sbb
sba = [mu]*(yb - ya) + [mu]*[eta]*(pa - pb - pwa)
sbb = [mu]*(ya - yb) + [mu]*[eta]*(pb - pa - pwb)
ska = 0.5*[phi]*(ra - rb) - pwa
skb = 0.5*[phi]*(rb - ra) - pwb

Sba = sba + Pa
Sbb = sbb + Pb
pwa = 0.0
pwb = 0.0
yac = ka_1
ybc = kb_1
qa = ya - yac
qb = yb - ybc
ka = ka_1 + 0.1*(ia - ka_1)
kb = kb_1 + 0.1*(ib - kb_1)
la = ya
lb = yb
Pa = [mu]*(pa - pb - pwa)
Pb = [mu]*(pb - pa - pwb)

Results:

# Time horizon (default is 10 periods)
h=1000
1-9,1000

Impulse for the exogenous variable:

plaau = -1
plbau = 0.0

Res-mod-II 11.54 150801

Note that for every variable its extra rate of growth (first row) as well as its cumulated extra rate of growth (second row) are recorded!

plaau -1.000

Period:	**1**	**2**	**3**	**4**	**5**
ca	-1.000	.300	.225	.176	.142
	-1.000	-.700	-.475	-.300	-.158
cb	.000	.000	.045	.068	.077
	.000	.000	.045	.113	.189
ia	2.000	-.300	-.180	-.108	-.065
	2.000	1.700	1.520	1.412	1.347
ib	.000	.300	.180	.108	.065
	.000	.300	.480	.588	.653
wa	-1.000	.100	.075	.058	.047
	-1.000	-.900	-.825	-.767	-.719
wb	.000	.000	.015	.022	.026
	.000	.000	.015	.038	.063
pa	.000	-.200	-.150	-.117	-.094
	.000	-.200	-.350	-.467	-.562
pb	.000	.000	-.030	-.045	-.051
	.000	.000	-.030	-.075	-.126
ra	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000

rb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ya	.000	.200	.150	.117	.094
	.000	.200	.350	.467	.562
yb	.000	.000	.030	.045	.051
	.000	.000	.030	.075	.126
sba	.000	.100	.060	.036	.022
	.000	.100	.160	.196	.218
sbb	.000	-.100	-.060	-.036	-.022
	.000	-.100	-.160	-.196	-.218
ska	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
skb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
Sba	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
Sbb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
pwa	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
pwb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
yac	.000	.200	.150	.117	.095
	.000	.200	.350	.467	.561
ybc	.000	.000	.030	.045	.051
	.000	.000	.030	.075	.126

qa	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
qb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ka	.200	.150	.117	.095	.079
	.200	.350	.467	.561	.640
kb	.000	.030	.045	.051	.053
	.000	.030	.075	.126	.179
la	.000	.200	.150	.117	.094
	.000	.200	.350	.467	.562
lb	.000	.000	.030	.045	.051
	.000	.000	.030	.075	.126
Pa	.000	-.100	-.060	-.036	-.022
	.000	-.100	-.160	-.196	-.218
Pb	.000	.100	.060	.036	.022
	.000	.100	.160	.196	.218

Period:	**6**	**7**	**8**	**9**	**116**
ca	.118	.100	.087	.076	.000
	-.040	.060	.147	.223	.875
cb	.079	.077	.073	.068	.000
	.268	.345	.418	.486	1.125
ia	-.039	-.023	-.014	-.008	.000
	1.308	1.285	1.271	1.263	1.250
ib	.039	.023	.014	.008	.000
	.692	.715	.729	.737	.750

wa	.039	.033	.029	.025	.000
	-.680	-.647	-.618	-.592	-.375
wb	.026	.026	.024	.023	.000
	.089	.115	.139	.162	.375
pa	-.079	-.067	-.058	-.051	.000
	-.640	-.707	-.765	-.815	-1.250
pb	-.053	-.051	-.048	-.045	.000
	-.179	-.230	-.279	-.324	-.750
ra	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
rb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ya	.079	.067	.058	.051	.000
	.640	.707	.765	.815	1.250
yb	.053	.051	.048	.045	.000
	.179	.230	.279	.324	.750
sba	.013	.008	.005	.003	.000
	.231	.238	.243	.246	.250
sbb	-.013	-.008	-.005	-.003	.000
	-.231	-.238	-.243	-.246	-.250
ska	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
skb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
Sba	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000

Sbb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
pwa	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
pwb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
yac	.079	.067	.058	.051	.000
	.640	.707	.765	.815	1.250
ybc	.053	.051	.048	.045	.000
	.179	.230	.279	.324	.750
qa	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
qb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
ka	.067	.058	.051	.045	.000
	.707	.765	.815	.860	1.250
kb	.051	.048	.045	.041	.000
	.230	.279	.324	.365	.750
la	.079	.067	.058	.051	.000
	.640	.707	.765	.815	1.250
lb	.053	.051	.048	.045	.000
	.179	.230	.279	.324	.750
Pa	-.013	-.008	-.005	-.003	.000
	-.231	-.238	-.243	-.246	-.250
Pb	.013	.008	.005	.003	.000
	.231	.238	.243	.246	.250

Case (III): Small Neo-Keynesian model to demonstrate the Self-Seeking case with Flexible Exchange Rates.

Define some parameters:

[betac] = .5
[lambda] = .666666
[psi= 0.666666]
[mu] = .5
[eta] = -2
[phi] = .333333

Equations:

ca = la + wa
cb = lb + wb
ia = ya_1 - 2*wa_1 + 3*Pa_1 - ra_1
ib = yb_1 - 2*wb_1 + 3*Pb_1 - rb_1
wa = [betac]*ya_1 + plaau
wb = [betac]*yb_1 + plbau
pa = pa_1 + [psi]*wa_1
pb = pb_1 + [psi]*wb_1
ra = (1/[phi])*(ya + pa + Pa)
rb = (1/[phi])*(yb + pb + Pb)
ya = [lambda]*ca + (1 - [lambda])*ia + sba
yb = [lambda]*cb + (1 - [lambda])*ib + sbb
sba = [mu]*(yb - ya) + [mu]*[eta]*(pa - pb - pwa)
sbb = [mu]*(ya - yb) + [mu]*[eta]*(pb - pa - pwb)

ska = 0.5*[phi]*(ra - rb) - pwa
skb = 0.5*[phi]*(rb - ra) - pwb
Sba = sba + Pa
Sbb = sbb + Pb
pwa = 0.5*(pa - pb)
pwb = 0.5*(pb - pa)
yac = ka_1
ybc = kb_1
qa = ya - yac
qb = yb - ybc
ka = ka_1 + 0.1*(ia - ka_1)
kb = kb_1 + 0.1*(ib - kb_1)
la = ya
lb = yb
Pa = [mu]*(pa - pb - pwa)
Pb = [mu]*(pb - pa - pwb)

Results:

# Time horizon (default is 10 periods)
h=1000

Impulse for the exogenous variable:

plaau = -1
plbau = 0.0

Res-mod-III 12.12 150801

Note that for every variable its extra rate of growth (first row) as well as its cumulated extra rate of growth (second row) are recorded!

plaau -1.000

Period:	**1**	**2**	**3**	**4**	**5**
ca	-2.250	1.938	1.766	.465	.157
	-2.250	-.312	1.453	1.918	2.075
cb	-.750	1.063	.234	-.465	-.157
	-.750	.313	.547	.082	-.075
ia	.000	4.500	-1.875	-.281	-.242
	.000	4.500	2.625	2.344	2.102
ib	.000	1.500	-2.125	.281	.242
	.000	1.500	-.625	-.344	-.102
wa	-1.000	-.625	1.281	.242	.111
	-1.000	-1.625	-.344	-.102	.010
wb	.000	-.375	.719	-.242	-.111
	.000	-.375	.344	.102	-.010
pa	.000	-.667	-1.083	-.229	-.068
	.000	-.667	-1.750	-1.979	-2.047
pb	.000	.000	-.250	.229	.068
	.000	.000	-.250	-.021	.047
ra	-3.750	5.188	-2.422	-.363	-.167

	-3.750	1.438	-.984	-1.348	-1.515
rb	-2.250	4.813	-1.578	.363	.167
	-2.250	2.563	.984	1.348	1.515
ya	-1.250	2.563	.484	.223	.046
	-1.250	1.313	1.797	2.020	2.065
yb	-.750	1.438	-.484	-.223	-.046
	-.750	.688	.203	-.020	-.065
sba	.250	-.229	-.068	.007	.022
	.250	.021	-.047	-.040	-.019
sbb	-.250	.229	.068	-.007	-.022
	-.250	-.021	.047	.040	.019
ska	-.250	.396	.276	.108	.012
	-.250	.146	.422	.530	.542
skb	.250	-.396	-.276	-.108	-.012
	.250	-.146	-.422	-.530	-.542
Sba	.250	-.396	-.276	-.108	-.012
	.250	-.146	-.422	-.530	-.542
Sbb	-.250	.396	.276	.108	.012
	-.250	.146	.422	.530	.542
pwa	.000	-.333	-.417	-.229	-.068
	.000	-.333	-.750	-.979	-1.047
pwb	.000	.333	.417	.229	.068
	.000	.333	.750	.979	1.047
yac	.000	.000	.450	.217	.168
	.000	.000	.450	.667	.835

ybc	.000	.000	.150	-.078	-.042
	.000	.000	.150	.072	.031
qa	-1.250	2.563	.034	.005	-.122
	-1.250	1.313	1.347	1.352	1.230
qb	-.750	1.438	-.634	-.145	-.004
	-.750	.688	.053	-.092	-.096
ka	.000	.450	.217	.168	.127
	.000	.450	.667	.835	.962
kb	.000	.150	-.078	-.042	-.013
	.000	.150	.072	.031	.018
la	-1.250	2.563	.484	.223	.046
	-1.250	1.313	1.797	2.020	2.065
lb	-.750	1.438	-.484	-.223	-.046
	-.750	.688	.203	-.020	-.065
Pa	.000	-.167	-.208	-.115	-.034
	.000	-.167	-.375	-.490	-.523
Pb	.000	.167	.208	.115	.034
	.000	.167	.375	.490	.523

Period:	**6**	**7**	**8**	**9**	**117**
ca	.002	-.038	-.029	-.012	.000
	2.077	2.039	2.010	1.998	2.000
cb	-.002	.038	.029	.012	.000
	-.077	-.039	-.010	.002	.000
ia	-.111	-.023	.011	.014	.000
	1.990	1.967	1.978	1.992	2.000

ib	.111	.023	-.011	-.014	.000
	.010	.033	.022	.008	.000
wa	.023	-.011	-.014	-.008	.000
	.033	.022	.008	.001	.000
wb	-.023	.011	.014	.008	.000
	-.033	-.022	-.008	-.001	.000
pa	.007	.022	.015	.006	.000
	-2.040	-2.019	-2.004	-1.998	-2.000
pb	-.007	-.022	-.015	-.006	.000
	.040	.019	.004	-.002	.000
ra	-.034	.016	.021	.011	.000
	-1.549	-1.533	-1.513	-1.501	-1.500
rb	.034	-.016	-.021	-.011	.000
	1.549	1.533	1.513	1.501	1.500
ya	-.021	-.027	-.015	-.005	.000
	2.044	2.017	2.002	1.997	2.000
yb	.021	.027	.015	.005	.000
	-.044	-.017	-.002	.003	.000
sba	.015	.006	.001	-.001	.000
	-.004	.002	.002	.001	.000
sbb	-.015	-.006	-.001	.001	.000
	.004	-.002	-.002	-.001	.000
ska	-.018	-.016	-.008	-.002	.000
	.524	.508	.500	.498	.500
skb	.018	.016	.008	.002	.000
	-.524	-.508	-.500	-.498	-.500

Sba	.018	.016	.008	.002	.000
	-.524	-.508	-.500	-.498	-.500
Sbb	-.018	-.016	-.008	-.002	.000
	.524	.508	.500	.498	.500
pwa	.007	.022	.015	.006	.000
	-1.040	-1.019	-1.004	-.998	-1.000
pwb	-.007	-.022	-.015	-.006	.000
	1.040	1.019	1.004	.998	1.000
yac	.127	.103	.090	.082	.000
	.962	1.065	1.155	1.237	2.000
ybc	-.013	-.001	.002	.000	.000
	.018	.017	.018	.019	.000
qa	-.148	-.130	-.106	-.087	.000
	1.082	.952	.847	.760	.000
qb	.034	.028	.014	.004	.000
	-.062	-.034	-.020	-.016	.000
ka	.103	.090	.082	.075	.000
	1.065	1.155	1.237	1.313	2.000
kb	-.001	.002	.000	-.001	.000
	.017	.018	.019	.018	.000
la	-.021	-.027	-.015	-.005	.000
	2.044	2.017	2.002	1.997	2.000
lb	.021	.027	.015	.005	.000
	-.044	-.017	-.002	.003	.000
Pa	.003	.011	.007	.003	.000
	-.520	-.509	-.502	-.499	-.500
Pb	-.003	-.011	-.007	-.003	.000
	.520	.509	.502	.499	.500

Case (IV): Small Neo-Keynesian model to demonstrate the Altruistic case with Fixed Exchange Rates.

Define some parameters:

[betac] = .5
[lambda] = .666666
[psi]=.666666
[mu] = .5
[eta] = -2
[phi] = .333333

Equations:

ca = la + wa
cb = lb + wb
ia = ya_1 - 2*wa_1 + 3*Pa_1 - ra_1
ib = yb_1 - 2*wb_1 + 3*Pb_1 - rb_1
wa = [betac]*ya_1 + plaau
wb = [betac]*yb_1 + plbau
pa = 0.5*pa_1 + [psi]*wa_1 + 0.5pb_1
pb = 0.5*pb_1 + [psi]*wb_1 + 0.5pa_1
ra = (1/[phi])*(ya + pa)
rb = (1/[phi])*(yb + pb)
ya = [lambda]*ca + (1 - [lambda])*ia + sba
yb = [lambda]*cb + (1 - [lambda])*ib + sbb
sba = [mu]*(yb - ya) + [mu]*[eta]*(pa - pb - pwa)
sbb = [mu]*(ya - yb) + [mu]*[eta]*(pb - pa - pwb)
ska = 0.5*[phi]*(ra - rb) - pwa

skb = 0.5*[phi]*(rb - ra) - pwb
Sba = sba + Pa
Sbb = sbb + Pb
pwa = 0.0
pwb = 0.0
yac = ka_1
ybc = kb_1
qa = ya - yac
qb = yb - ybc
ka = ka_1 + 0.1*(ia - ka_1)
kb = kb_1 + 0.1*(ib - kb_1)
la = ya
lb = yb
Pa = [mu]*(pa - pb - pwa)
Pb = [mu]*(pb - pa - pwb)

Results:

# Time horizon (default is 10 periods)
h=1000
1-9,1000

Impulse for the exogenous variable:

plaau = -1
plbau = 0.0

Res-mod-IV 12.24 150801

Note that for every variable its extra rate of growth (first row) as well as its cumulated extra rate of growth (second row) are recorded!

plaau -1.000

Period:	**1**	**2**	**3**	**4**	**5**
ca	-2.250	2.188	1.391	-.613	-.140
	-2.250	-.062	1.328	.715	.575
cb	-.750	.813	.609	.613	.140
	-.750	.063	.672	1.285	1.425
ia	.000	4.500	-3.375	-.781	1.227
	.000	4.500	1.125	.344	1.570
ib	.000	1.500	-.625	.781	-1.227
	.000	1.500	.875	1.656	.430
wa	-1.000	-.625	1.406	-.008	-.303
	-1.000	-1.625	-.219	-.227	-.529
wb	.000	-.375	.594	.008	.303
	.000	-.375	.219	.227	.529
pa	.000	-.667	-.750	.271	-.005
	.000	-.667	-1.417	-1.146	-1.151
pb	.000	.000	-.583	-.271	.005
	.000	.000	-.583	-.854	-.849

ra	-3.750	6.438	-2.297	-1.004	.474
	-3.750	2.688	.391	-.613	-.140
rb	-2.250	3.563	-1.703	1.004	-.474
	-2.250	1.313	-.391	.613	.140
ya	-1.250	2.813	-.016	-.605	.163
	-1.250	1.563	1.547	.941	1.104
yb	-.750	1.188	.016	.605	-.163
	-.750	.438	.453	1.059	.896
sba	.250	-.146	.182	.064	-.153
	.250	.104	.286	.350	.198
sbb	-.250	.146	-.182	-.064	.153
	-.250	-.104	-.286	-.350	-.198
ska	-.250	.479	-.099	-.335	.158
	-.250	.229	.130	-.204	-.047
skb	.250	-.479	.099	.335	-.158
	.250	-.229	-.130	.204	.047
Sba	.250	-.479	.099	.335	-.158
	.250	-.229	-.130	.204	.047
Sbb	-.250	.479	-.099	-.335	.158
	-.250	.229	.130	-.204	-.047
pwa	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
pwb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
yac	.000	.000	.450	.067	-.017
	.000	.000	.450	.517	.500

ybc	.000	.000	.150	.072	.143
	.000	.000	.150	.222	.366
qa	-1.250	2.813	-.466	-.673	.180
	-1.250	1.563	1.097	.424	.604
qb	-.750	1.188	-.134	.533	-.306
	-.750	.438	.303	.836	.530
ka	.000	.450	.067	-.017	.107
	.000	.450	.517	.500	.607
kb	.000	.150	.072	.143	.006
	.000	.150	.222	.366	.372
la	-1.250	2.813	-.016	-.605	.163
	-1.250	1.563	1.547	.941	1.104
lb	-.750	1.188	.016	.605	-.163
	-.750	.438	.453	1.059	.896
Pa	.000	-.333	-.083	.271	-.005
	.000	-.333	-.417	-.146	-.151
Pb	.000	.333	.083	-.271	.005
	.000	.333	.417	.146	.151

Period:	**6**	**7**	**8**	**9**	**112**
ca	.495	-.019	-.366	.106	.000
	1.070	1.051	.685	.791	.875
cb	-.495	.019	.366	-.106	.000
	.930	.949	1.315	1.209	1.125
ia	.279	-.990	.038	.733	.000
	1.850	.860	.898	1.631	1.250

ib	-.279	.990	-.038	-.733	.000
	.150	1.140	1.102	.369	.750
wa	.082	.207	-.113	-.127	.000
	-.448	-.241	-.354	-.481	-.375
wb	-.082	-.207	.113	.127	.000
	.448	.241	.354	.481	.375
pa	-.202	.054	.138	-.075	.000
	-1.353	-1.299	-1.161	-1.236	-1.250
pb	.202	-.054	-.138	.075	.000
	-.647	-.701	-.839	-.764	-.750
ra	.635	-.514	-.347	.472	.000
	.495	-.019	-.366	.106	.000
rb	-.635	.514	.347	-.472	.000
	-.495	.019	.366	-.106	.000
ya	.413	-.226	-.254	.233	.000
	1.518	1.292	1.039	1.271	1.250
yb	-.413	.226	.254	-.233	.000
	.482	.708	.961	.729	.750
sba	-.010	.117	-.022	-.082	.000
	.188	.305	.283	.201	.250
sbb	.010	-.117	.022	.082	.000
	-.188	-.305	-.283	-.201	-.250
ska	.212	-.171	-.116	.157	.000
	.165	-.006	-.122	.035	.000
skb	-.212	.171	.116	-.157	.000
	-.165	.006	.122	-.035	.000

Sba	-.212	.171	.116	-.157	.000
	-.165	.006	.122	-.035	.000
Sbb	.212	-.171	-.116	.157	.000
	.165	-.006	-.122	.035	.000
pwa	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
pwb	.000	.000	.000	.000	.000
	.000	.000	.000	.000	.000
yac	.107	.124	.013	.015	.000
	.607	.731	.744	.760	1.250
ybc	.006	-.022	.079	.067	.000
	.372	.350	.429	.496	.750
qa	.306	-.350	-.266	.217	.000
	.911	.561	.294	.512	.000
qb	-.420	.248	.175	-.300	.000
	.110	.358	.532	.232	.000
ka	.124	.013	.015	.087	.000
	.731	.744	.760	.847	1.250
kb	-.022	.079	.067	-.013	.000
	.350	.429	.496	.484	.750
la	.413	-.226	-.254	.233	.000
	1.518	1.292	1.039	1.271	1.250
lb	-.413	.226	.254	-.233	.000
	.482	.708	.961	.729	.750
Pa	-.202	.054	.138	-.075	.000
	-.353	-.299	-.161	-.236	-.250
Pb	.202	-.054	-.138	.075	.000
	.353	.299	.161	.236	.250

References

Gordon, R.J. (2000), “Interpreting the ‘One Big Wave in US Long-Term Productivity Growth”, in van Ark, Kuipers and Kuper

Jorgenson, D.W. and K.J. Stiroh (2000), “”Raising the Speed Limit: US Economic Growth in the Information Age”, *Brookings Papers on Economic Activity I*, pp. 125-236

Maddison, A. (2001), *The World Economy: A Millennial Perspective*, Development Centre Studies, Development Centre of the Organisation for Economic Co-operation and Development, Paris.

Meulendijks, Pieter J.F.G. (1992), *De betekenis van reële en financiële internationalionalisatiegraden voor volkshuishoudingen* [On the significance of varying degrees of international economic and financial integration for economies] Wolters-Noordhoff, Groningen.

Meulendijks, Pieter J.F.G. and Dick B.J. Schouten (1995),”Exchange rates and the European business cycle. An application of a quasi-emprical two-country model”, *Economic Modelling*, Volume 12, Number 1, pp. 35-52.

Oliner, S.D. and D.E. Sichel (2000), “The Resurgence of Growth in the late 1990s: Is Information Technology the Story?”, Federal Reserve Board, Washington, D.C., February.