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MACROECONOMICS AFTER KALECKI AND KEYNES

Post-Keynesian Foundations

(Edward Elgar 2023)

Chapter 4
‘POST-KEYNESIAN CONSTANT PRICE MACROECONOMIC MODELS’

Content

4.1 Introduction

4.2 The model economy

4.3 A constant price closed economy model without a government

4.4 The government in the constant price closed economy model: taxes and government expenditures

4.5 An open economy model with constant prices

4.6 Macroeconomic effects of wage inequality

4.7 Macroeconomic effects of gender wage gaps

4.1 INTRODUCTION

Basic constant price post-Keynesian short-run macroeconomic models

- principle of effective demand
- distribution of income between different social groups or classes.
- financing side of effective demand, i.e. credit and interest on credit.
- short-run models: all the stocks (capital, financial assets and liabilities) are taken as given and exogenous, as results of past developments.
- labour force and labour supply are taken to be given and exogenous
- neither the capital stock nor the labour force are fully utilised

4.1 THE MODEL ECONOMY

4.2.1 Production, finance, income and expenditures

- Start with closed economy without a government, with workers, firms/managers and rentiers, banks, ... and a central bank
- Firms use labour (N) and capital stock (K) as inputs, produce a homogeneous output (Y) with uniform mark-up price (p) on variable costs,
- No overhead labour, no depreciation of capital stock
- Fixed production coefficients, constant labour productivity (y)
- Economic activity is usually below potential output (Y^p) given by capital stock
- Unemployment (UE) as the rule, no labour supply constraint
- Firms pay wages (W) to workers and interest on credit (R) to rentiers, retain part of the profits (Π_F)

- Workers only consume (C_W), and do not save
- Owners/managers of firms don‘t consume
- Rentiers partly consume (C_R) and partly save (S_R) their income, in terms of further credit granted to firms or by holding money
- Investment (I) drives the system
- Long-term capital stock finance draws on accumulated retained earnings (E_F) and credit by rentiers (B_{FR}) and banks (B_{FB}), which are owned by rentiers
- Exogenous interest rate (i), endogenous credit (B) and money (M) (‚horizontalist‘ view)
- Capital stock (K) and stocks of financial assets (B) are given in the short run

Table 4.1: Balance sheet matrix for a closed economy with neither a government nor a central bank

	Workers' households	Rentiers' households	Firms	Banks	Σ
Deposits		$+D_R$		$-D_R$	0
Loans		$+B_{FR}$	$-(B_{FR}+B_{FB})$	$+B_{FB}$	0
Capital			pK		pK
Σ	0	$+B_{FR}+D_R$	$+E_F$	0	pK $= B_{FR}+D_R+E_F$ $= B_{FR}+B_{FB}+E_F$

D_R: deposits held by rentiers, B_{FR}: Debt issued by firms held by rentiers, B_{FB}: debt issued by firms and held by rentiers, pK: nominal capital stock, E_F: accumulated retained earnings

Table 4.2: Transaction flow matrix for a closed economy with neither a government nor a central bank

	Workers' households	Rentiers' households	Firms' current	Firms' capital	Banks	Σ
Consumption	$-pC_W$	$-pC_R$	$+pC_W+pC_R$			0
Investment			$+pI$	$-pI$		0
Wages	$+W$		$-W$			0
Retained profits			$-\Pi_F$	$+dE_F$		0
Distributed profits: interest		$+R_F$	$-R_F$			0
Change in deposits		$-dD_R$			$+dD_R$	0
Change in loans		$-dB_{FR}$		$+dB_{FR}+dB_{FB}$	$-dB_{FB}$	0
Σ	0	0	0	0	0	0

pC_W: consumption out of wages, pC_R: consumption out of rentiers' income, pI: investment, W: wages, Π_F: retained profits, dE_F: change in accumulated retained earnings, R: rentiers' income, dB_R: change in stock of credit granted by rentiers, dB_B: change in stock of credit granted by banks, dM: change in the stock of money

- Rentiers own the banks and firms' interest payments to banks are immediately forwarded to rentiers' households

(4.1) $$pK = E_F + B_{FR} + B_{FB}\,.$$

(4.2) $$pK = E_F + B_{FR} + D_R\,.$$

(4.3) $$pY = pC_W + pC_R + pI\,.$$

(4.4) $$pY = W + \Pi = W + \Pi_F + R = W + \Pi_F + i\left(B_{FR} + B_{FB}\right).$$

(4.5) $$W = pC_W\,,$$

(4.6) $$R = pC_R + S_R = pC_R + dB_{FR} + dD_R\,.$$

(4.7) $$pI = dE_F + dB_{FR} + dB_{FB}\,,$$

(4.8) $$\Pi = pC_R + pI\,.$$

4.2.2 Endogenous money and exogenous interest rates with a central bank

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Table 4.3: Balance sheet matrix for a closed economy without a government but with a central bank

	Workers' households	Rentiers' households	Firms	Commercial banks	Central bank	Σ
Money/ Reserves		$+M_R$		$+M_B$	$-M$	0
Deposits		$+D_R$		$-D_R$		0
Loans		$+B_{FR}$	$-(B_{FR}+B_{FB})$	$+bB_{FB}$	$+(1-b)B_{FB}$	0
Capital			pK			pK
Σ	0	$+B_{FR}+D_R+M_R$	$+E_F$	0	0	$pK = E_F+B_{FR}+D_R+M_R = E_F+B_{FR}+B_{FB}$

The consistency of the balance sheet matrix requires:

(4.9) $$pK = E_F + B_{FR} + B_{FB} = E_F + B_{FR} + D_R + M_R \,.$$

Table 4.4: Transaction flow matrix for a closed economy without a government but with a central bank

	Workers' households	Rentiers' house-holds	Firms' current	Firms' capital	Commercial banks	Central bank	Σ
Consumption	$-pC_W$	$-pC_R$	$+pC_W+pC_R$				0
Investment			$+pI$	$-pI$			0
Wages	$+W$		$-W$				0
Retained profits			$-\Pi_F$	$+dE_F$			0
Distributed profits: interest		$+R_F$	$-R_F$				0
Change in Money/Reserves		$-dM_R$			$-dM_B$	$+dM$	0
Change in deposits		$-dD_R$			$+dD_R$		0
Change in loans		$-dB_{FR}$		$+dB_{FR}+dB_{FB}$	$-bdB_{FB}$	$-(1-b)dB_{FB}$	0
Σ	0	0	0	0	0	0	0

- PK ‘horizontalist’ monetary view pioneered by Kaldor (1982), Lavoie (1992, 1996b), Moore (1989)
  ‘Money is credit-driven; loans make deposits; deposits make reserves. The supply of and the demand for credit money are interdependent. The control instrument of the central bank is not a quantity but a price, the rate of interest.’ (Lavoie, 1992, p. 170)

- Supported by Bank of England (Jakab and Kumhof 2015, McLeay et al. 2014a, 2014b), US Federal Reserve (Ihrig et al. 2021), and even the Deutsche Bundesbank (2017).

Central banks:

- set base rate of interest in the money market
- define standards for creditworthiness
- supply central bank money to commercial banks
- act as ‘lender of last resort’

Commercial banks:

- mark-up central bank's base rate

  (4.10) $i = \left(1 + m_B\right) i_{CB}$.

  ➢ mark-up is determined by costs of banking, liquidity preference, risk assessment (default risks), competition in the banking sector, …

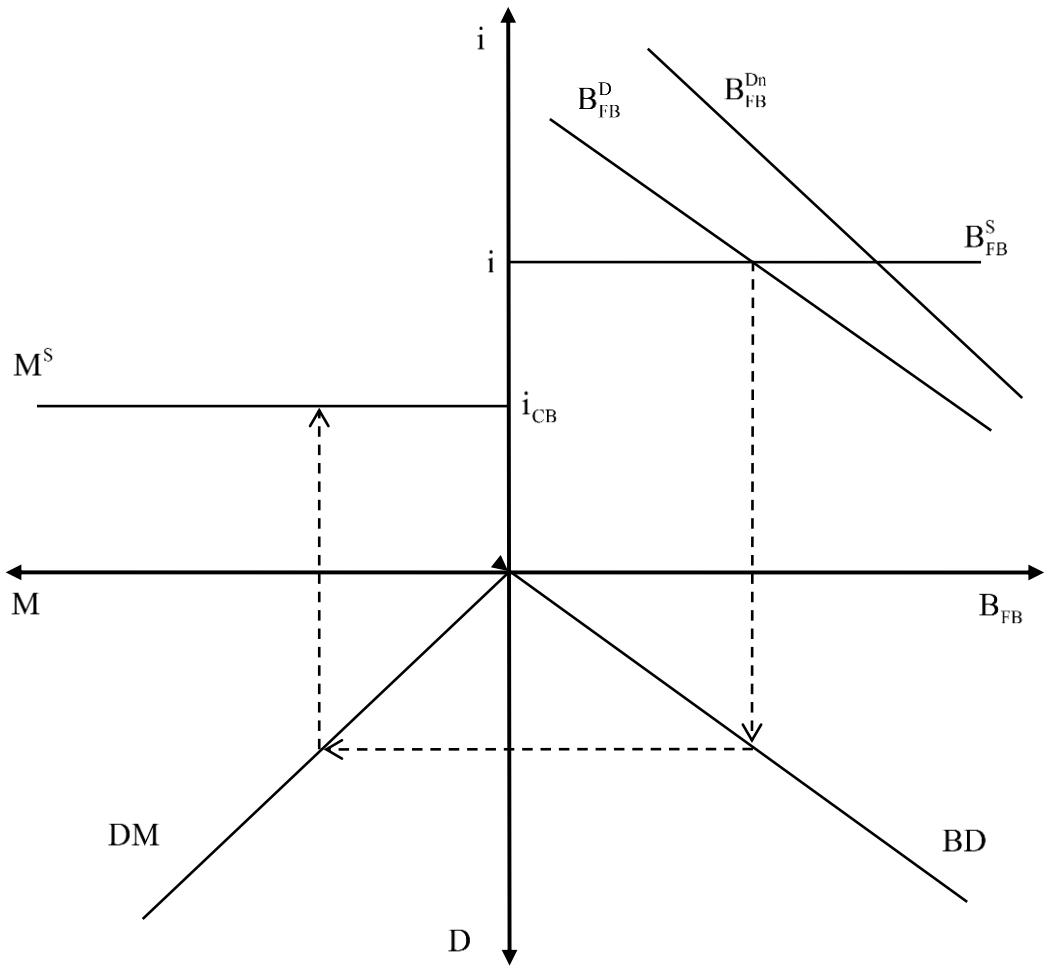
- check creditworthiness of firms and households

- supply credit to creditworthy firms and households

Credit and money are endogenously determined by economic process

Interest rate is an exogenous distribution parameter for income generation and growth process

Figure 4.1: The horizontalist approach to endogenous money and credit



i_{CB}: central bank rate of interest in money market

i: commercial bank rate of interest in credit market

B^{S}_{FB}: credit supply by banks

B^{D}_{FB}: creditworthy credit demand

B^{Dn}_{FB}: notional credit demand

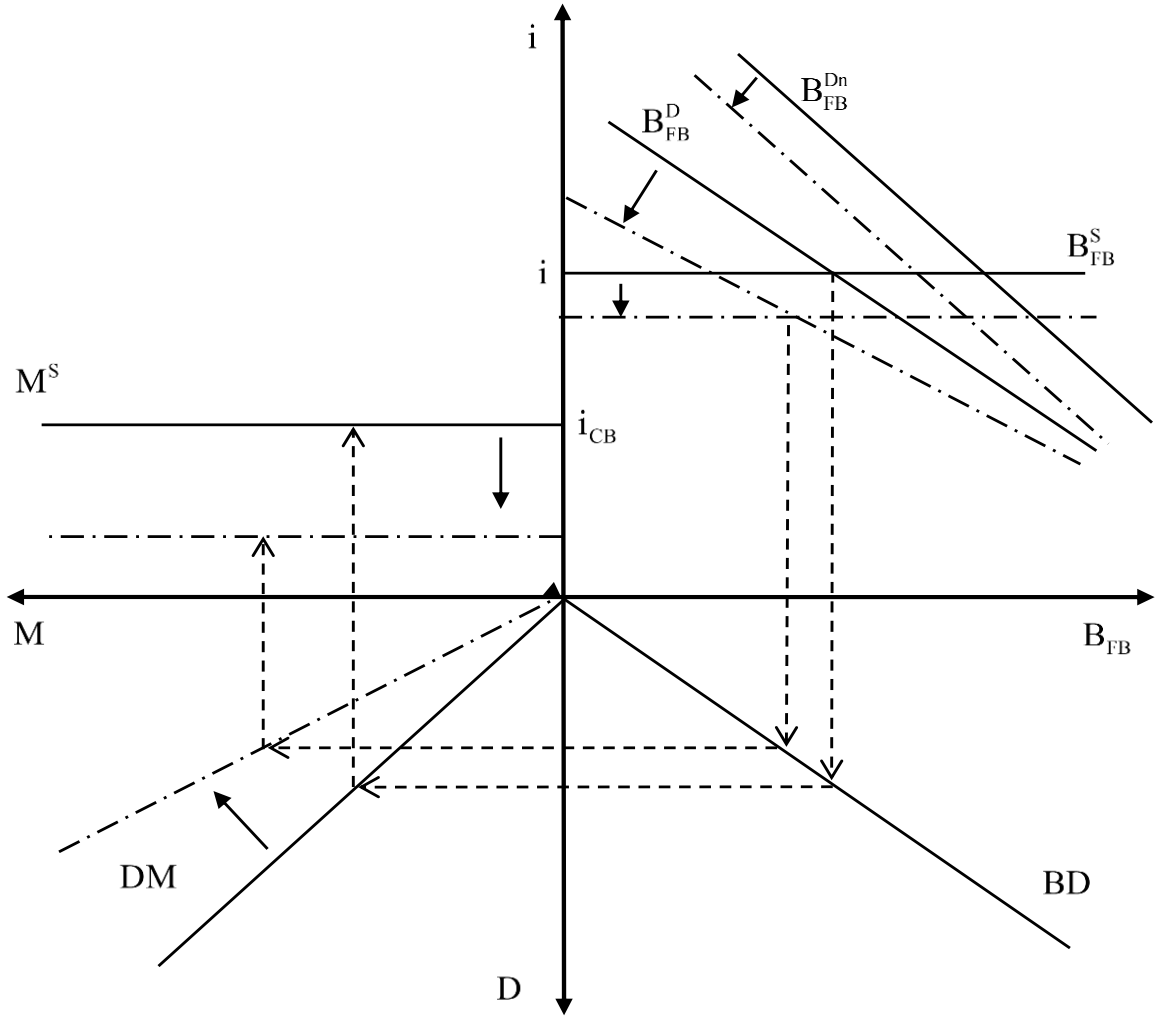
BD: loand-deposit curve

D: deposits

DM: deposit-reserves curve

M^{S}: supply of reserves

Figure 4.2: Interest rates, credit and money during the financial and economic crisis 2007-09



- Central bank controls the short-term money market rate of interest
- Central bank policies affect the long-term credit market rate of interest,
- ➔ **potential asymmetry**: interest rate can be increased in any case, but not decreased if commercial banks increase their mark-ups (increase in liquidity preference, perceived risk of credit default, …)
- Volume of credit and quantity of money are endogenously determined by economic acitivity, credit demand and payment conventions
- Changes in the long-term rate of interest may affect credit demand and hence the volumes of credit and money, if credit demand is interest elastic
- ➔ **potential asymmetry**: increasing the rate of interest will finally choke credit demand and economic activity, decreasing the rate of interest may not be sufficient to stimulate credit demand and economic activity (investment trap), furthermore: zero lower bound for nominal rate of interest.

4.3 A CONSTANT PRICE CLOSED ECONOMY MODEL WITHOUT A GOVERNMENT

4.3.1 The basic model

Prices (p) are determined by mark-up (m) pricing on constant unit direct labour costs (w/y).

(4.11) $$p = \left[1 + m(i)\right]\frac{w}{y}, \qquad m > 0, \frac{\partial m}{\partial i} \geq 0 .$$

w: nominal wage rate y: labour productivity, i: interest rate

The mark-up determines the share of gross profits (Π) in national income (h), and thus also the share of wages (W) in national income ($1 - h = \Omega$):

(4.12) $$h = \frac{\Pi}{pY} = \frac{\Pi}{W + \Pi} = \frac{mW}{W + mW} = \frac{m}{1 + m},$$

(4.13) $$\Omega = 1 - h = \frac{W}{pY} = \frac{W}{W + \Pi} = \frac{W}{W + mW} = \frac{1}{1 + m} .$$

Figure 4.3: Mark-up pricing and income distribution without overhead labour costs

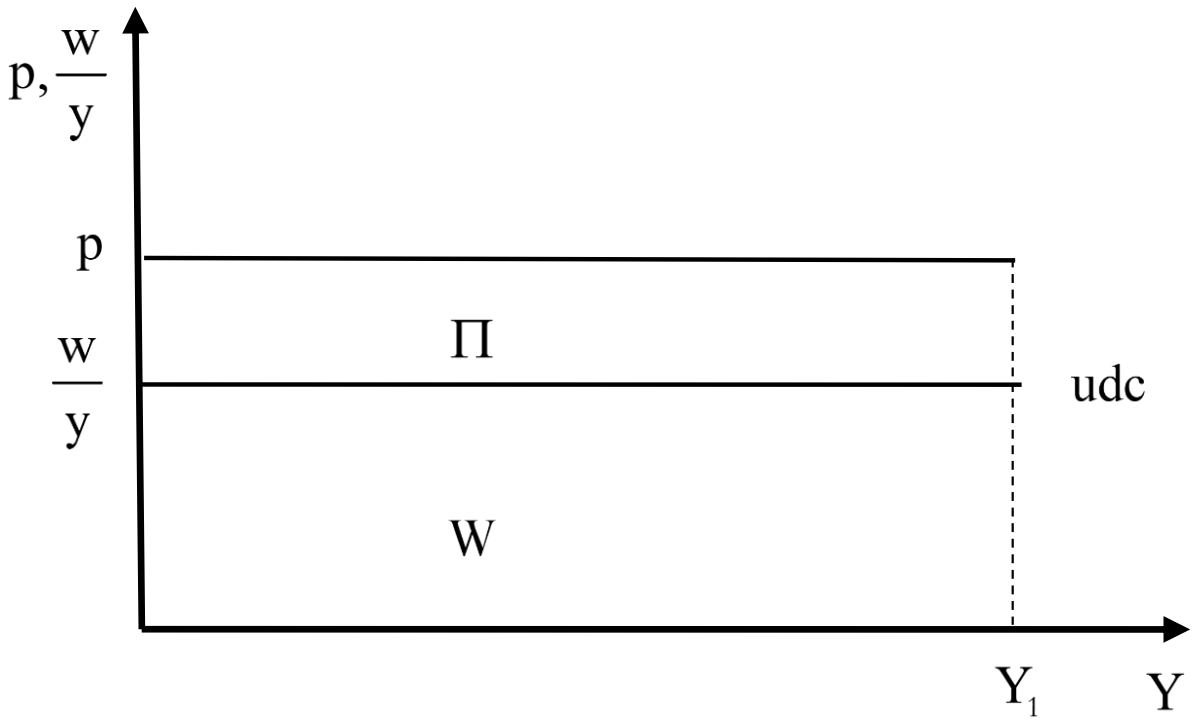
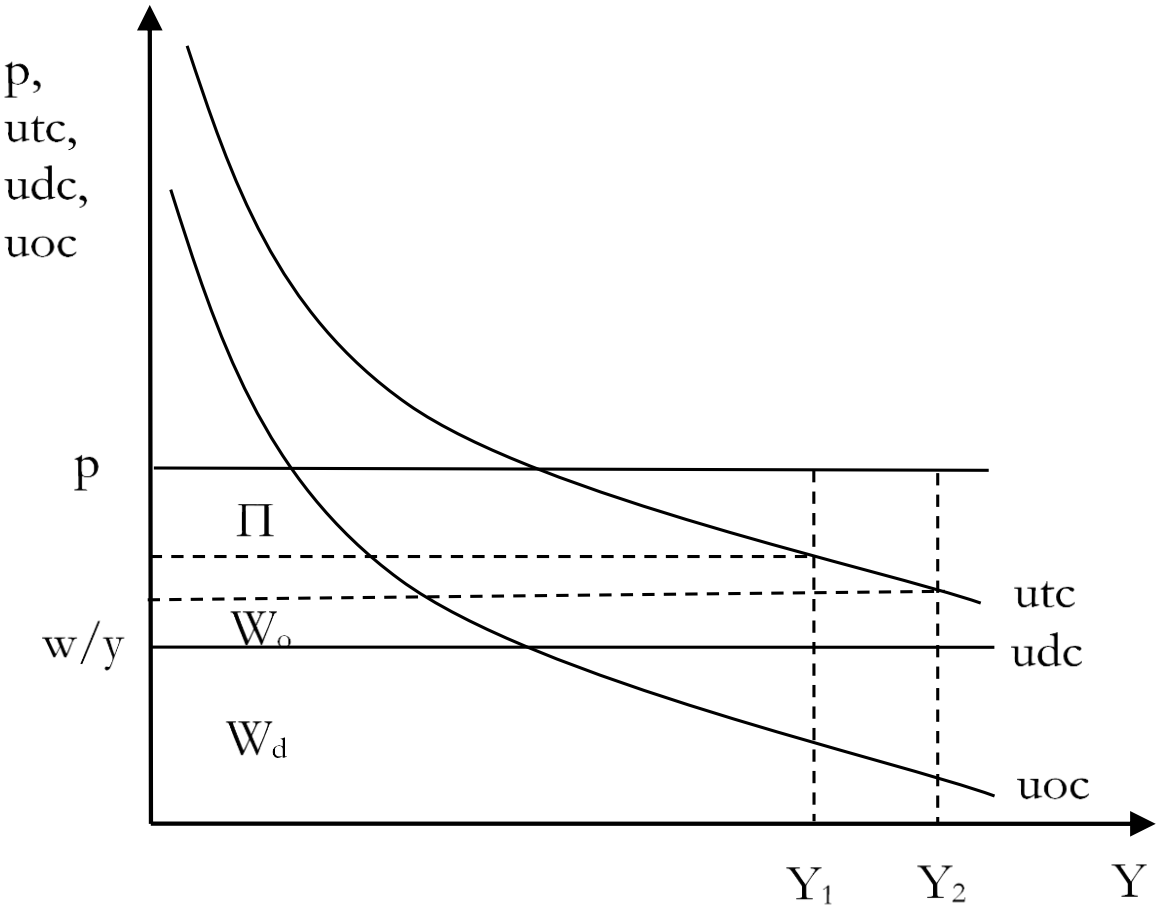


Figure 4.4: Mark-up pricing and income distribution with overhead labour costs



Moving from a low output level Y_1 to the higher level Y_2, again with constant unit direct labour costs, mark-ups and prices, will yield the following:

- first, as before, a constant share of wages of direct labour in national income (W_d/pY);
- second, a falling share of overhead labour/managerial salaries in national income (W_o/pY);
- third, a falling share of overhead labour/managerial income in total labour income [$W_o/(W_d + W_o)$];
- fourth, a fall in the total labour income share [$(W_d + W_o)/pY$]; and
- fifth, a rise in the profit share in national income (Π/pY).

- ➢ The profit share has a pro-cyclical behaviour, the wage share a countercyclical pattern (Lavoie 2009b, 2014, Chapters 4-5)
- ➢ Empirics: Hein 2014b, Chapter 1, Stockhammer 2017, Rolim 2019

Saving (S) as sum of retained earnings and saving out of rentiers' income:

(4.14) $$S = \Pi_F + S_R = \Pi - R + S_R = hpY - iB_F + s_R iB_F = hpY - (1 - s_R) iB_F,$$
$$1 \geq s_R > 0$$

Π: profits (retained earnings and interest), R: interest, S_R: Saving out of interest income, s_R: propensity to save out of interest income, B_F: volume of credit to firms

Investment is determined by expectations („animal spirits", Keynes) resp. autonomous investment, demand for goods and interest payments („principle of increasing risk", Kalecki)

(4.15) $$pI = pI_a + \beta pY - \theta iB_F,\ I_a, \beta, \theta \geq 0\ .$$

Goods market equilibrium:

(4.16) $$pI = S,$$

Stability conditions:

(4.17) $$\frac{\partial S}{\partial (pY)} > \frac{\partial (pI)}{\partial (pY)} \Rightarrow h > \beta \Rightarrow h - \beta > 0.$$

4.3.2 The goods market equilibrium and the effects of changes in model parameters

Plugging equations (4.14) and (4.15) into equation (4.16), the goods market equilibrium value for income can be derived:

$$\text{(4.18)} \quad pY^* = \frac{pI_a + (1 - s_R - \theta) iB_F}{h - \beta},$$

And using the equilibrium value for income from equation (4.18) in equation (4.14) or (4.15), we can then calculate the respective equilibrium values for investment and saving:

$$\text{(4.19)} \quad pI^* = S^* = \frac{hpI_a + \left[\beta(1 - s_R) - \theta h\right] iB_F}{h - \beta},$$

By using the definition of the profit share ($h = \Pi / pY$) we can derive from equation (4.18) also the equilibrium value of profits:

$$\text{(4.20)} \quad \Pi^* = \frac{h\left[pI_a + (1 - s_R - \theta) iB_F\right]}{h - \beta},$$

Figure 4.5: Short-run equilibrium income in a private closed economy

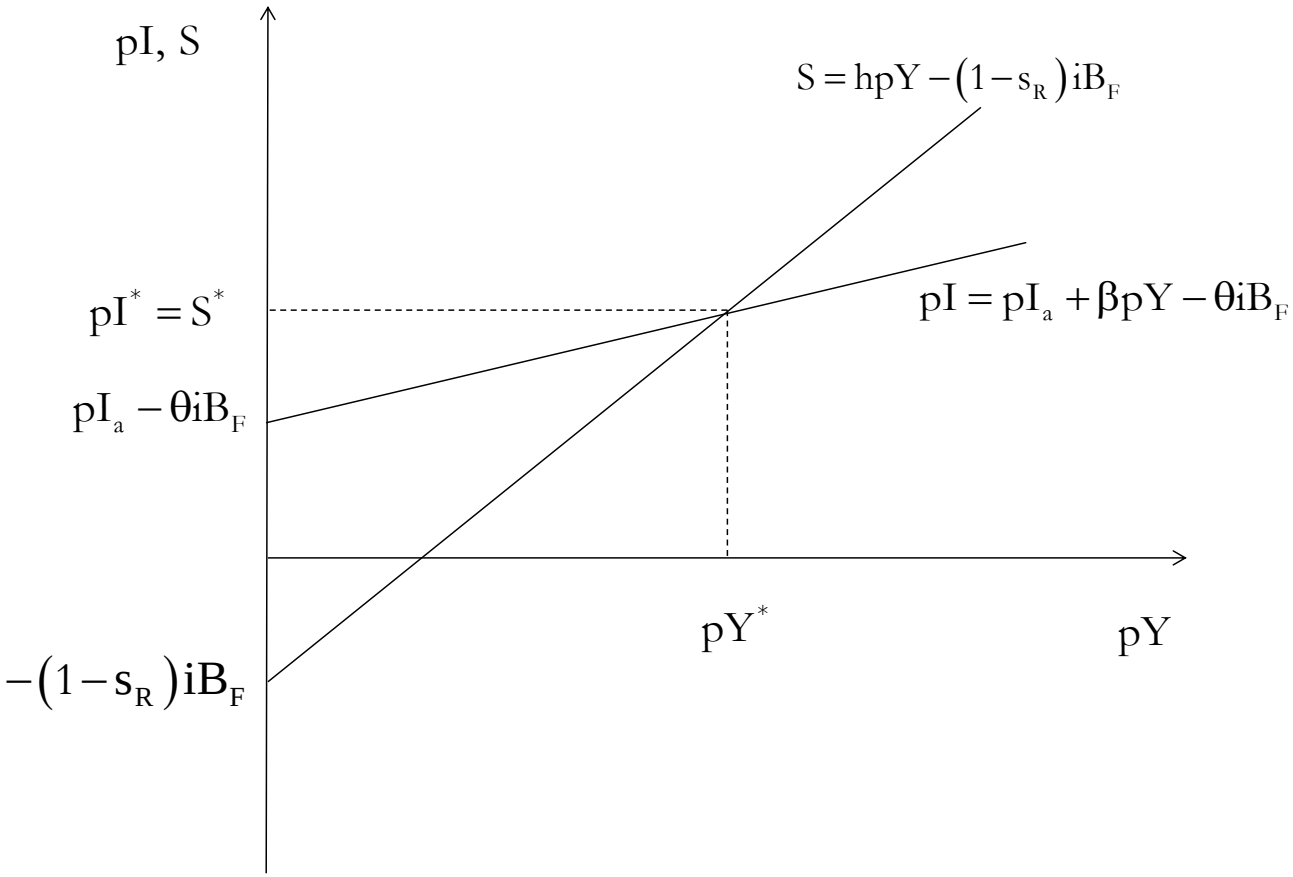


Figure 4.6: An increase in animal spirits/autonomous investment

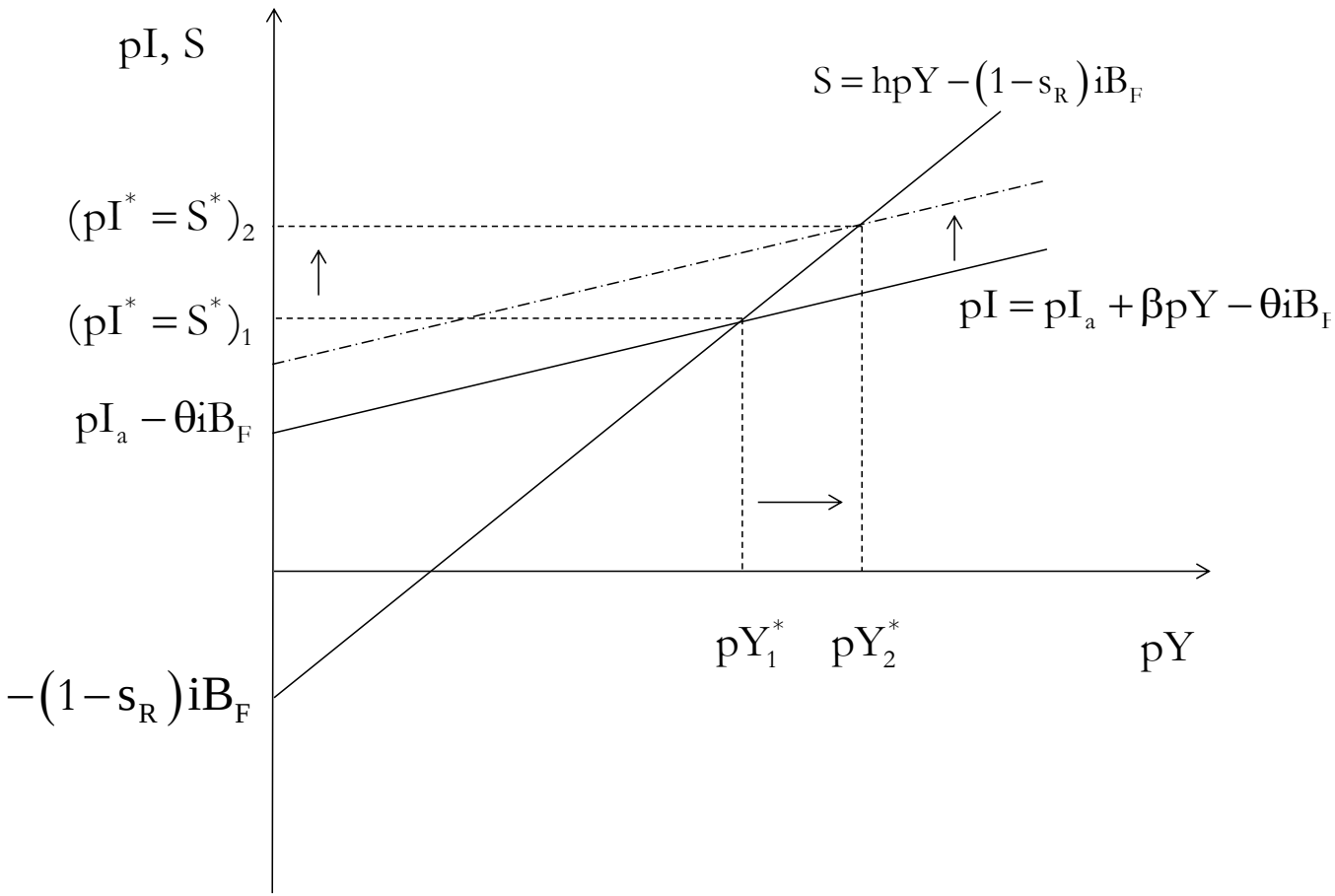


Figure 4.7: An increase in the rentiers' propensity to save

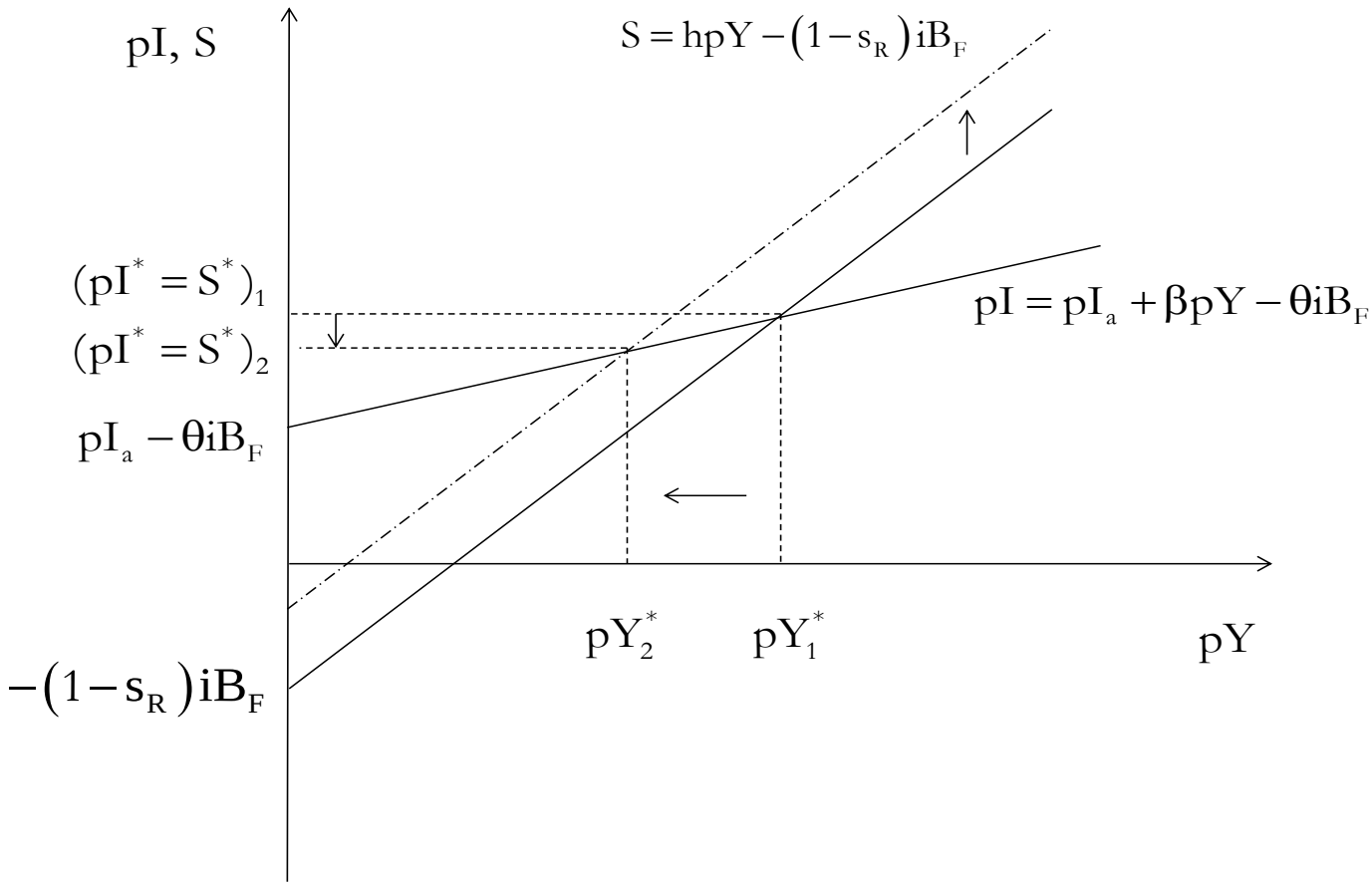
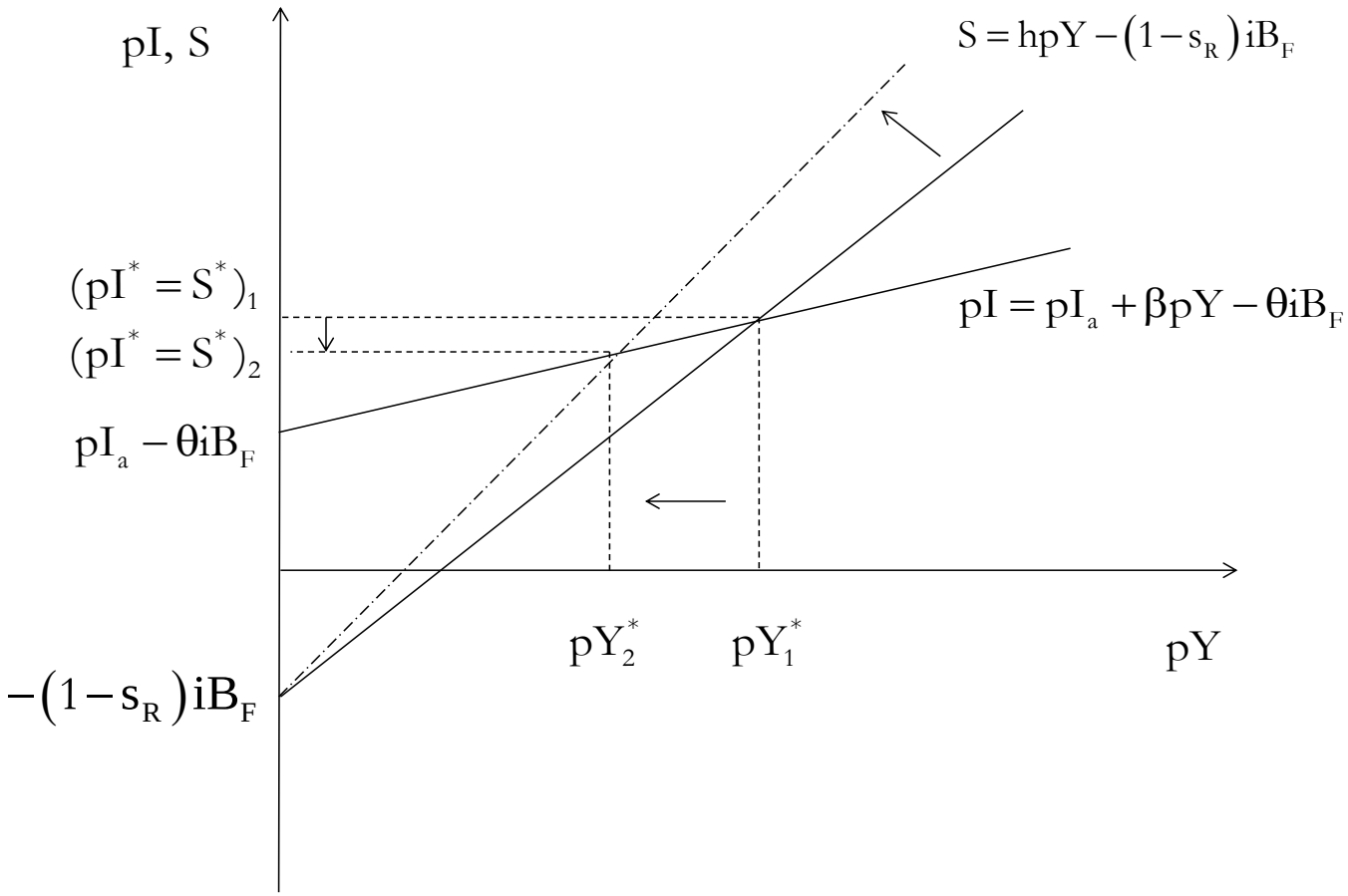


Figure 4.8: An increase in the profit share



A rise in the profit share

(4.18a) $$\frac{\partial\left(pY^*\right)}{\partial h}=\frac{-\left[pI_a+\left(1-s_R-\theta\right)iB_F\right]}{\left(h-\beta\right)^2}=\frac{-pY^*}{h-\beta}<0,$$

(4.19a) $$\frac{\partial\left(pI^*\right)}{\partial h}=\frac{-\beta\left[pI_a+\left(1-s_R-\theta\right)iB_F\right]}{\left(h-\beta\right)^2}=\frac{-\beta pY^*}{h-\beta}<0,$$

(4.20a) $$\frac{\partial\Pi^*}{\partial h}=\frac{-\beta\left[pI_a+\left(1-s_R-\theta\right)iB_F\right]}{\left(h-\beta\right)^2}=\frac{-\beta pY^*}{h-\beta}<0.$$

➔ wage-led aggregate demand + paradox of costs

A change in the interest rate

(4.18b) $$\frac{\partial\left(pY^*\right)}{\partial i} = \frac{\left(1-s_R-\theta\right)B_F - pY^*\frac{\partial h}{\partial i}}{h-\beta},$$

(4.19b) $$\frac{\partial\left(pI^*\right)}{\partial i} = \frac{\left[\beta\left(1-s_R\right)-\theta h\right]B_F - \beta pY^*\frac{\partial h}{\partial i}}{h-\beta},$$

(4.20b) $$\frac{\partial\Pi^*}{\partial i} = \frac{h\left(1-s_R-\theta\right)B_F - \beta pY^*\frac{\partial h}{\partial i}}{h-\beta}.$$

Figure 4.9: A rise in the interest rate with an interest-inelastic profit share I: the normal case – fall in equilibrium income and investment/saving

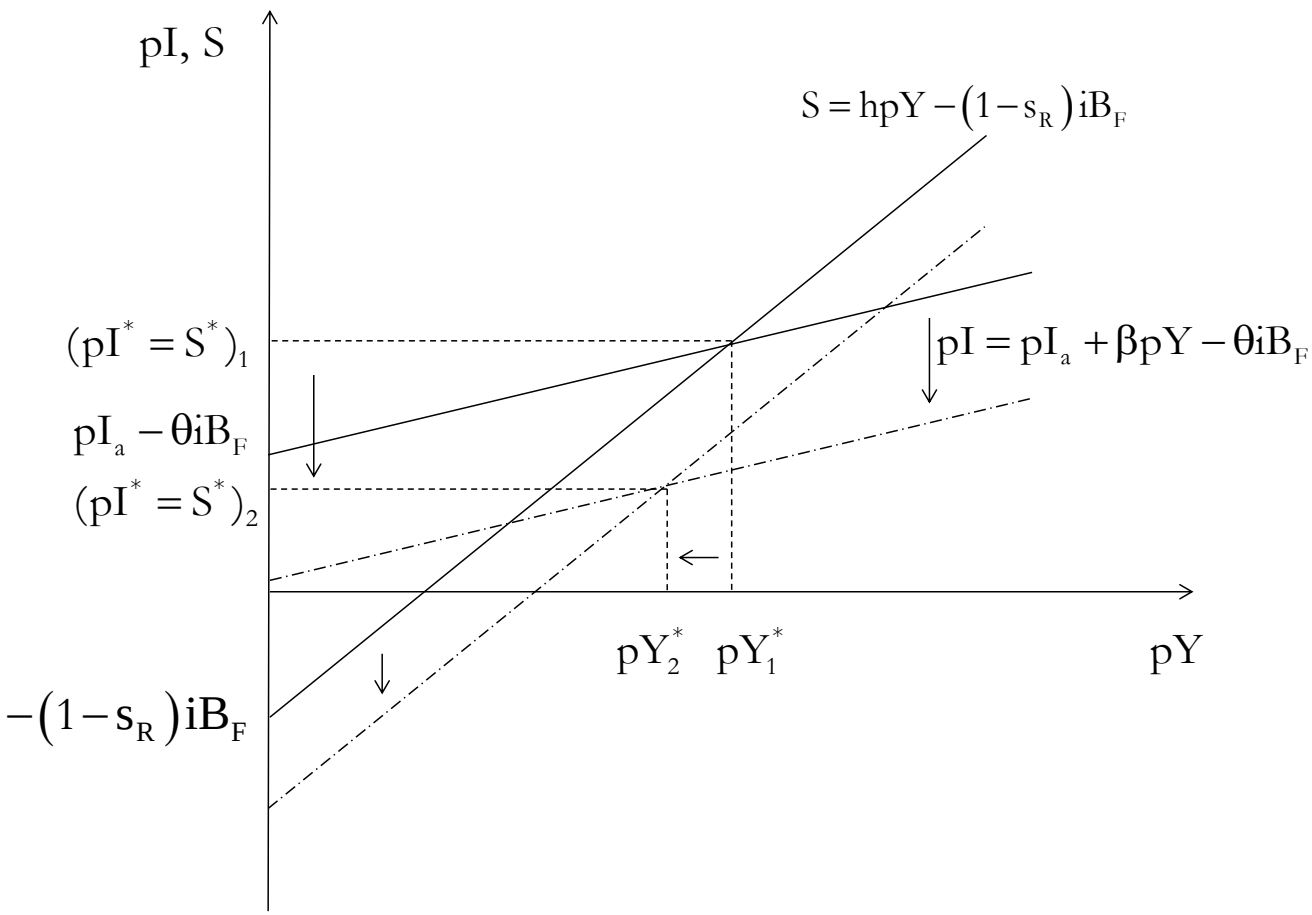


Figure 4.10: A rise in the interest rate with an interest-inelastic profit share II: the intermediate case – rise in equilibrium income but fall in investment/saving

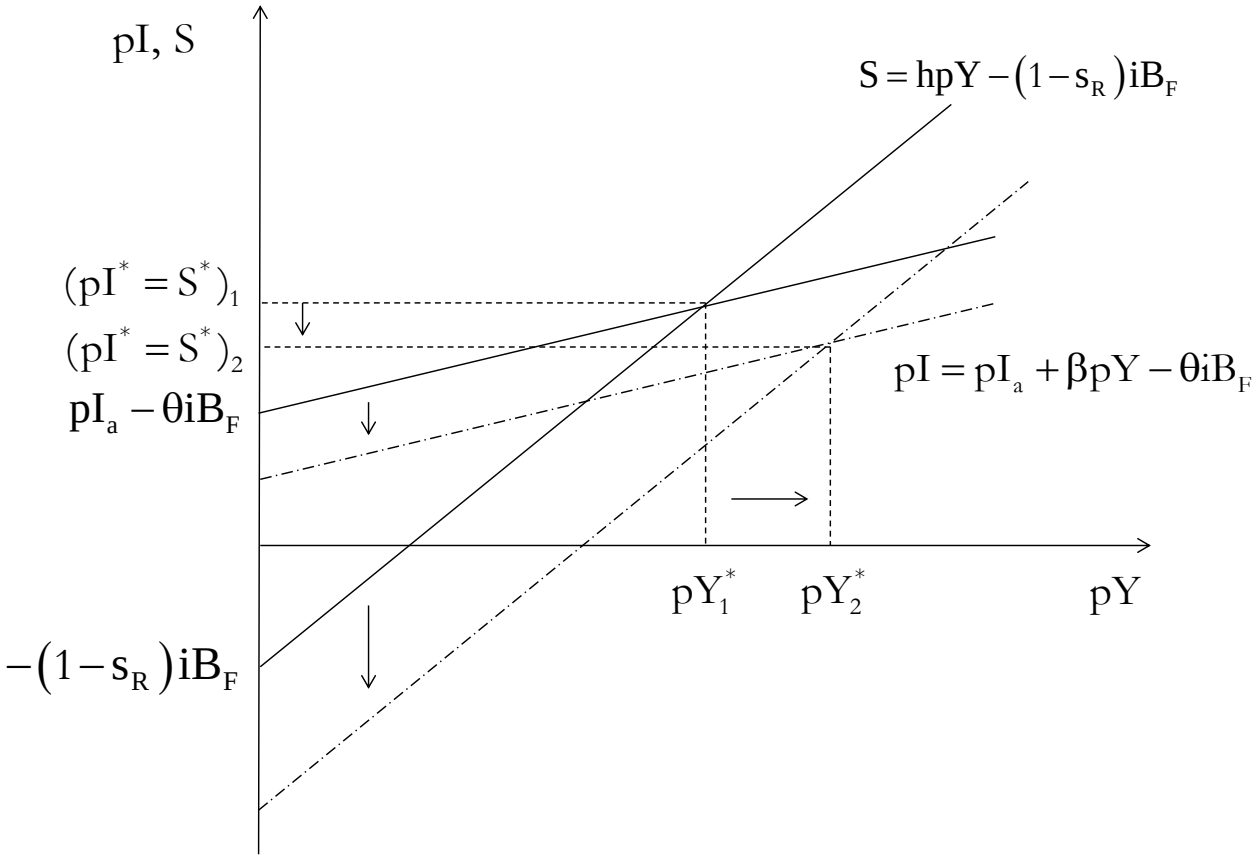
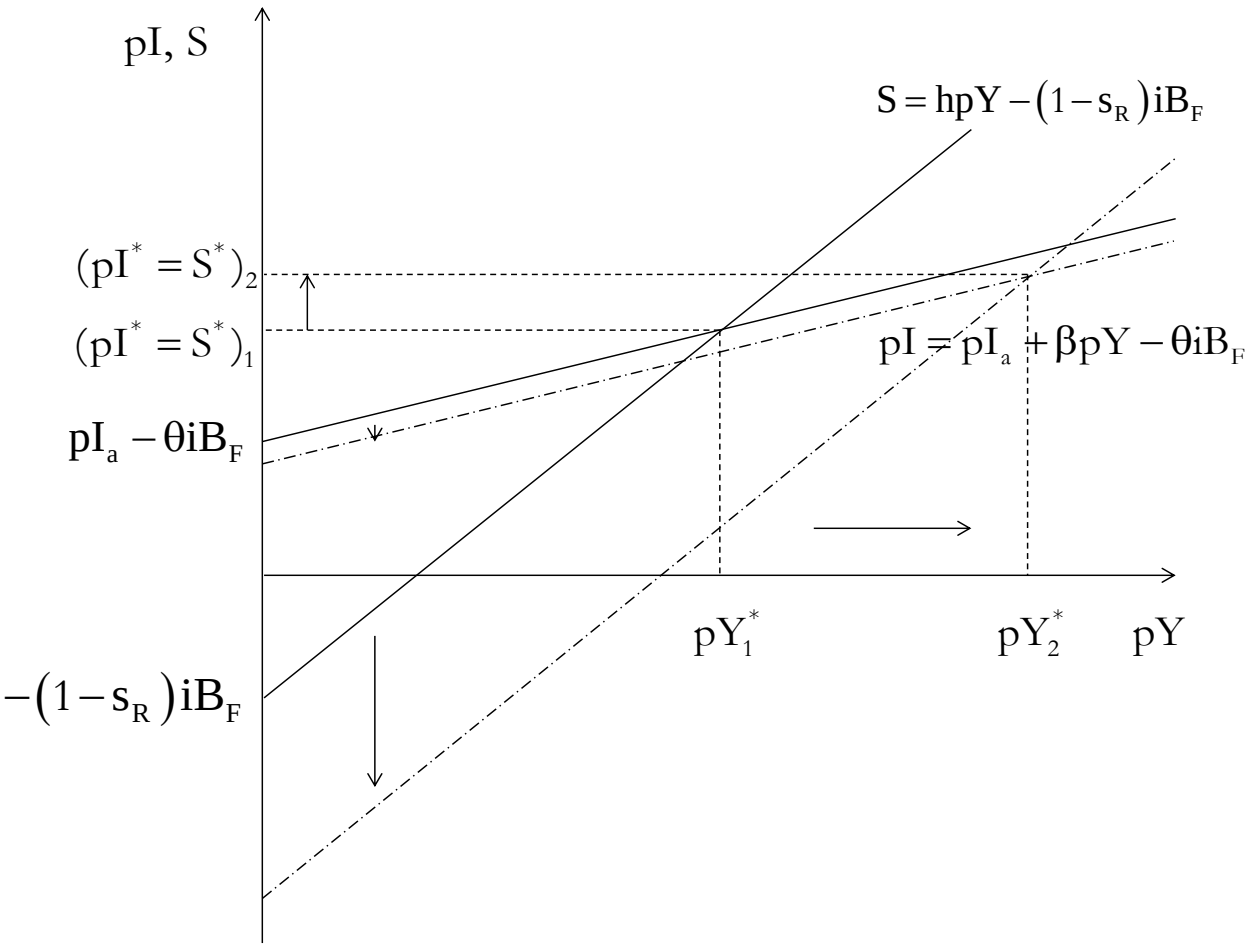


Figure 4.11: A rise in the interest rate with an interest-inelastic profit share III: the puzzling case – rise in equilibrium income and investment/saving



(4.18c) $$\frac{\partial\left(pY^{*}\right)}{\partial B_F}=\frac{\left(1-s_R-\theta\right)i}{h-\beta},$$

(4.19c) $$\frac{\partial\left(pI^{*}\right)}{\partial B_F}=\frac{\left[\beta\left(1-s_R\right)-\theta h\right]i}{h-\beta},$$

(4.20c) $$\frac{\partial\Pi^{*}}{\partial B_F}=\frac{h\left(1-s_R-\theta\right)i}{h-\beta}.$$

Table 4.5: Responses of equilibrium output/income, investment/saving and profits towards changes in exogenous variables and parameters

	pY^*	$pI^* = S^*$	Π^*
pI_a	+	+	+
s_R	–	–	–
h	–	–	–
i	+/–	+/–	+/–
B_F	+/–	+/–	+/–

4.4 THE GOVERNMENT IN THE CONSTANT PRICE CLOSED ECONOMY MODEL: TAXES AND GOVERNMENT EXPENDITURES

4.4.1 The basic model

- We keep all the assumptions regarding the private sector from the previous section.
- However, regarding the ownership of the central bank, we now assume that it is owned by the government and not by the rentiers

Table 4.6: Balance sheet matrix for a closed economy with a government and a central bank

	Workers' households	Rentiers' households	Firms	Government	Commercial banks	Central bank	Σ
Money/ Reserves		$+M_R$			$+M_B$	$-M$	0
Deposits		$+D_R$			$-D_R$		0
Loans		$+B_{FR}+B_{GR}$	$-(B_{FR}+B_{FB})$	$-(B_{GR}+B_{GB})$	$+b(B_{FB}+B_{GB})$	$+(1-b)(B_{FB}+B_{GB})$	0
Capital			pK				pK
Σ	0	$+B_{FR}+B_{GR}$ $+D_R+M_R$	$+E_F$	$-(B_{GR}+B_{GB})$	0	0	pK = $E_F+B_{FR}+D_R+$ M_R-B_{GB} = $E_F+B_{FR}+B_{FB}$

The consistency of the balance sheet matrix requires:

(4.21) $$pK = E_F + B_{FR} + D_R + M_R - B_{GB} = E_F + B_{FR} + B_{FB}\,.$$

Table 4.7: Transaction flow matrix for a closed economy with a government and a central bank

	Workers' households	Rentiers' households	Firms' current	Firms' capital	Government	Commercial banks	Central bank	Σ
Taxes	$-T_W$	$-T_R$	$-T_F$		$+T$			0
Government consumption			$+G$		$-G$			0
Consumption	$-pC_W$	$-pC_R$	$+pC_W+pC_R$					0
Investment			$+pI$	$-pI$				0
Wages	$+W$		$-W$					0
Retained profits			$-\Pi_F$	$+dE_F$				0
Interest payments		$+R_F+R_G$	$-R_F$		$-R_G$			0
Change in Money/ Reserves		$-dM_R$				$-dM_B$	$+dM$	0
Change in deposits		$-dD_R$				$+dD_R$		
Change in loans		$-dB_{FR}-dB_{GR}$		$+dB_{FR}+dB_B$	$+dB_{GR}+dB_{GB}$	$-bd(B_{FB}+B_{GB})$	$-(1-b)$ $d(B_{FB}+B_{GB})$	0
Σ	0	0	0	0	0	0	0	0

Accounting identity of incomes and expenditures:

$$
\begin{aligned}
pY &= pY_P + iB_G = pI + pC_R + pC_W + G + iB_G \\
&= \Pi_F^{net} + T_F + R^{net} + T_R + W^{net} + T_W = \Pi_F^{net} + R^{net} + W^{net} + T,
\end{aligned}
\tag{4.22}
$$

with pY as total income, composed of income from production (pY_P) plus government interest payments.

Assumptions:

- the tax rate on wages is zero: $t_W = 0$
- the tax rates on interest income and on retained profits are the same: $t_\Pi = t_F = t_R \geq 0$
- central bank does not hold corporate and government bonds, hence no reserves in the system.
- Governments will thus only pay interest on their stock of debt to rentiers and not receive any interest income via the central bank

Income distribution in production is determined by mark-up pricing. The mark-up may be tax-elastic.

(4.23) $$h = \frac{\Pi}{pY_P} = \frac{\Pi}{W+\Pi} = \frac{m}{1+m}, \qquad m > 0, \frac{\partial m}{\partial i} \geq 0, \frac{\partial m}{\partial t_\Pi} \geq 0,$$

(4.24) $$\Omega = 1 - h = \frac{W}{pY_P} = \frac{1}{1+m}.$$

Government expenditures on goods and services (G) are autonomous and a policy variable. Government interest payments to rentiers, directly or via banks, (iB_G) are exogenous in the short run.

Tax revenues are endogenous

(4.25)

$$T = T_F + T_R = t_\Pi \Pi_F + t_\Pi R = t_\Pi \left(hpY_P - iB_F\right) + t_\Pi \left(iB_F + iB_G\right) = t_\Pi \left(hpY_P + iB_G\right)$$

Since workers spend their net income after taxes and do not save, we have:

(4.26) $$pC_W = W = (1-h)pY_P.$$

Retained profits after taxes are saved by definition:

(4.27) $$\Pi_F^{net} = (1-t_\Pi)\Pi_F = (1-t_\Pi)(hpY_P - iB_F).$$

Rentiers save a certain fraction of their net income after taxes, which is composed of interest payments of firms and of governments:

(4.28) $$S_R = (1-t_\Pi)s_R i(B_F + B_G), \qquad 1 \geq s_R > 0.$$

Summing up (4.27) and (4.28) we obtain for the saving function in our model economy:

(4.29) $$\begin{aligned} S &= \Pi_F^{net} + S_R = (1-t_\Pi)\left[hpY_P - iB_F + s_R i(B_F + B_G)\right] \\ &= (1-t_\Pi)\left\{hpY_P - i\left[(1-s_R)B_F - s_R B_G\right]\right\}, \; 1 \geq s_R > 0, \; 1 > t_\Pi \geq 0. \end{aligned}$$

(4.30) $$\begin{aligned} pI &= pI_a + \beta pY_P - \theta\left[iB_F + t_\Pi\left(hpY_P - iB_F\right)\right] \\ &= pI_a + \left(\beta - \theta t_\Pi h\right)pY_P - \theta\left(1 - t_\Pi\right)iB_F, \qquad pI_a, \beta, \theta \geq 0,\ \beta - \theta t_\Pi h > 0 \end{aligned}$$

With $\beta - \theta t_\Pi h > 0$.

The equilibrium condition is:

(4.31) $$pI + G + iB_G = S + T,$$

and the stability condition with autonomous G and exogenous iB_G is given as:

(4.32) $$\frac{\partial S}{\partial\left(pY_P\right)} + \frac{\partial T}{\partial\left(pY_P\right)} > \frac{\partial\left(pI\right)}{\partial\left(pY_P\right)} \Rightarrow \left(1 - t_\Pi\right)h + t_\Pi h > \beta - \theta t_\Pi h \Rightarrow \left(1 + \theta t_\Pi\right)h - \beta > 0$$

4.4.2 The goods market equilibrium and the effects of changes in model parameters

Plugging in equations (4.25), (4.29) and (4.30) into equation (4.31), and assuming government expenditures on goods and services to be exogenous, yields equilibrium output and income from production:

$$\text{(4.33)} \quad pY_P^* = \frac{pI_a + G + (1-t_\Pi)i\left[(1-s_R-\theta)B_F + (1-s_R)B_G\right]}{(1+\theta t_\Pi)h - \beta}$$

For total equilibrium income we have to add government interest payments:

$$\text{(4.34)} \quad \begin{aligned} pY^* &= pY_P^* + iB_G \\ &= \frac{pI_a + G + (1-t_\Pi)i\left[(1-s_R-\theta)B_F + (1-s_R)B_G\right] + \left[(1+\theta t_\Pi)h - \beta\right]iB_G}{(1+\theta t_\Pi)h - \beta} \\ &= \frac{pI_a + G + i\left\{(1-t_\Pi)(1-s_R-\theta)B_F + \left[(1-t_\Pi)(1-s_R) + (1+\theta t_\Pi)h - \beta\right]B_G\right\}}{(1+\theta t_\Pi)h - \beta}. \end{aligned}$$

Equilibrium gross profits from production are given by the profit share in equation (4.23) and equilibrium income from production in equation (4.33):

(4.35) $$\Pi^* = hpY_P^* = \frac{h\left\{pI_a + G + (1-t_\Pi)i\left[(1-s_R-\theta)B_F + (1-s_R)B_G\right]\right\}}{(1+\theta t_\Pi)h-\beta}.$$

Finally, equilibrium tax revenues can also be determined making use of equilibrium profits or equilibrium income in production:

(4.36) $$\begin{aligned} T^* &= T_F + T_R = t_\Pi\left(\Pi^* + iB_G\right) = t_\Pi\left(hpY_P^* + iB_G\right) \\ &= \frac{t_\Pi\left\langle h\left\{pI_a + G + i(1-t_\Pi)\left[(1-s_R-\theta)B_F + (1-s_R)\right]B_G\right\} + \left[(1+\theta t_\Pi)h-\beta\right]iB_G\right\rangle}{(1+\theta t_\Pi)h-\beta} \\ &= \frac{t_\Pi\left\langle h\left[pI_a + G + (1-t_\Pi)(1-s_R-\theta)iB_F\right] + \left\{h\left[(1-t_\Pi)(1-s_R)+1+\theta t_\Pi\right]-\beta\right\}iB_G\right\rangle}{(1+\theta t_\Pi)h-\beta} \end{aligned}$$

Animal spirits have a positive effect on the equilibrium. The saving paradox and the paradox of costs remain valid:

(4.33a)
$$\frac{\partial\left(pY_P^*\right)}{\partial h}=\frac{-\left\{pI_a+G+i\left(1-t_\Pi\right)\left[\left(1-s_R-\theta\right)B_F+\left(1-s_R\right)B_G\right]\right\}\left(1+\theta t_\Pi\right)}{\left[\left(1+\theta t_\Pi\right)h-\beta\right]^2}$$
$$=\frac{-\left(1+\theta t_\Pi\right)pY_P^*}{\left(1+\theta t_\Pi\right)h-\beta}<0$$

(4.35a)
$$\frac{\partial\Pi^*}{\partial h}=\frac{-\beta\left\{pI_a+G+i\left(1-t_\Pi\right)\left[\left(1-s_R-\theta\right)B_F+\left(1-s_R\right)\right]B_G\right\}}{\left[\left(1+\theta t_\Pi\right)h-\beta\right]^2}=\frac{-\beta pY_p^*}{\left(1+\theta t_\Pi\right)h-\beta}<0\,.$$

(4.36a)
$$\frac{\partial T^*}{\partial h}=t_\Pi\frac{\partial\Pi^*}{\partial h}=\frac{-t_\Pi\beta pY_p^*}{\left(1+\theta t_\Pi\right)h-\beta}<0\,.$$

The impact of a higher interest will be positive in the puzzling case regarding the effect of re-distribution between firms and rentiers ($1-s_R-\theta>0$). But even in the normal case ($1-s_R-\theta<0$), the effect of a rise in the interest rate on equilibrium output and income may be positive.

(4.33b) $$\frac{\partial\left(pY_P^*\right)}{\partial i}=\frac{\left(1-t_\Pi\right)\left[\left(1-s_R-\theta\right)B_F+\left(1-s_R\right)B_G\right]}{\left(1+\theta t_\Pi\right)h-\beta}.$$

A higher stock of government debt will raise equilibrium income, profits and tax revenues, whereas a higher stock of corporate debt will have expansionary effects in the puzzling case, or the debt-led regime, but contractionary impacts in the normal case, or the debt-burdened regime, derived in the previous section:

(4.33c) $$\frac{\partial\left(pY_P^*\right)}{\partial B_G} = \frac{\left(1-t_\Pi\right)\left(1-s_R\right)i}{\left(1+\theta t_\Pi\right)h-\beta} > 0\,,$$

(4.33d) $$\frac{\partial\left(pY_P^*\right)}{\partial B_F} = \frac{\left(1-t_\Pi\right)\left(1-s_R-\theta\right)i}{\left(1+\theta t_\Pi\right)h-\beta}\,.$$

Government expenditures:

(4.33e) $$\frac{\partial\left(pY_P^*\right)}{\partial G} = \frac{1}{\left(1+\theta t_\Pi\right)h-\beta} > 0,$$

(4.35b) $$\frac{\partial \Pi^*}{\partial G} = \frac{h}{h\left(1+\theta t_\Pi\right)-\beta} > 0,$$

(4.36b) $$\frac{\partial T^*}{\partial G} = \frac{t_\Pi h}{\left(1+\theta t_\Pi\right)h-\beta} > 0.$$

The values of the income multiplier of government expenditures in equation (4.33e):

- is negatively affected by the profit share, the tax rate on profits and by the responsiveness of firms' investment towards internal funds,
- and positively by the accelerator effect in the investment function.

- Deficit financed government expenditures are partly self-financing. A long-term financing gap will have to be covered by increasing government bond holding of rentiers out of their higher income and saving.

- For the society as a whole deficit financed government expenditures are always financing themselves through higher incomes, as the basis for higher tax revenues and higher demand for government bonds, as already Kalecki (1944) had clearly pointed out.

Effects of taxation:

(4.33f)
$$\frac{\partial\left(pY_P^*\right)}{\partial t_\Pi} = \frac{-\theta h\left(pI_a + G\right) - i\left[\left(1 - s_R - \theta\right)B_F + \left(1 - s_R\right)B_G\right]\left[\left(1+\theta\right)h - \beta\right]}{\left[\left(1+\theta t_\Pi\right)h - \beta\right]^2}$$
$$= \frac{-\theta h p Y_P^* - i\left[\left(1 - s_R - \theta\right)B_F + \left(1 - s_R\right)B_G\right]}{\left(1+\theta t_\Pi\right)h - \beta} < 0$$

The contractive effects of an increase in the tax rate will even be stronger if we allow for a tax-elastic mark-up and thus an increase in the profit share accompanying a rise in the tax rate on profits:

(4.33g)
$$\frac{\partial\left(pY_P^*\right)}{\partial t_\Pi} = \frac{-\left[\theta h + \left(1+\theta t_\Pi\right)\frac{\partial h}{\partial t_\Pi}\right]pY_P^* - i\left[\left(1 - s_R - \theta\right)B_F + \left(1 - s_R\right)B_G\right]}{\left(1+\theta t_\Pi\right)h - \beta} < 0 .$$

The effect of a higher tax rate on tax revenues is undetermined:

(4.36c)
$$\frac{\partial T^*}{\partial t_\Pi} = hpY_P^* + iG_B + t_\Pi h\frac{\partial\left(pY_P^*\right)}{\partial t_\Pi} .$$

Table 4.8: Responses of equilibrium income/output, profits and tax revenues towards changes in exogenous variables and parameters

	pY^*	pY_P^*	Π^*	T^*
pI_a	+	+	+	+
s_R	–	–	–	–
h	–	–	–	–
i	+/–	+/–	+/–	+/–
B_F	+/–	+/–	+/–	+/–
B_G	+	+	+	+
G	+	+	+	+
t_Π	–	–	–	+/–

4.4.3 Equilibrium with a balanced government budget

(4.37) $G + iB_G = T$,

With this, the goods market equilibrium condition from equation (4.31) turns to:

(4.38) $pI = S$.

The stability of the goods market equilibrium now requires:

(4.39) $$\frac{\partial S}{\partial (pY_P)} > \frac{\partial (pI)}{\partial (pY_P)} \Rightarrow (1 - t_\Pi) h > \beta - \theta t_\Pi h \Rightarrow h\left[1 - t_\Pi (1 - \theta)\right] - \beta > 0$$

Plugging the saving function (4.29) and the investment function (4.30) into equation (4.38) yields:

(4.40) $$pY_P^* = \frac{pI_a + (1 - t_\Pi) i\left[(1 - s_R - \theta) B_F - s_R B_G\right]}{\left[1 - t_\Pi (1 - \theta)\right] h - \beta}$$

Equilibrium output and income from production are positively affected by animal spirits, and negatively by the propensity to save out of rentiers' income and by the profit share, as in the previous model.

(4.40a) $$\frac{\partial\left(pY_P^*\right)}{\partial t_\Pi} = \frac{i\left[s_R B_G - \left(1 - s_R - \theta\right) B_F\right] + \left(1-\theta\right) hpY_P^*}{\left[1 - t_\Pi\left(1-\theta\right)\right]h - \beta} > 0 .$$

The effect of an increase in the tax rate on equilibrium income generated in production is always positive, irrespective of puzzling or normal cases, because we have $\left(1-\theta\right)hpY_P^* - \left(1-\theta\right)iB_F > 0$.

⇨ Haavelmo (1945): balanced budget multiplier

Tax-elastic mark-up may undermine positive effects:

(4.40b) $$\frac{\partial\left(pY_P^*\right)}{\partial t_\Pi} = \frac{i\left[s_R B_G - \left(1 - s_R - \theta\right) B_F\right] + \left\{\left(1-\theta\right)h - \left[1 - t_\Pi\left(1-\theta\right)\right]\frac{\partial h}{\partial t_\Pi}\right\} pY_P^*}{\left[1 - t_\Pi\left(1-\theta\right)\right]h - \beta} .$$

4.4.4 Going beyond the short run: government debt dynamics

A constant government debt-GDP ratio ($B_G / pY = B_G / Y^n$) requires that government debt (B_G) and nominal GDP ($pY=Y^n$) grow at the same rate:

$$(4.41) \quad \hat{B}_G = \frac{dB_G}{B_G} = \frac{d(pY)}{pY} = \widehat{(pY)} = \hat{p} + \hat{Y} .$$

Since the government deficit (D) is given by:

$$(4.42) \quad D = G + iB_G - T = dB_G ,$$

with G representing government expenditures and T government revenues (taxes etc.), equation (4.40) becomes:

$$(4.43) \quad \hat{B}_G = \frac{dB_G}{B_G} = \frac{D}{B_G} = \frac{\frac{D}{pY}}{\frac{B_G}{pY}} = \widehat{(pY)} = \hat{p} + \hat{Y} \quad \Rightarrow \quad \frac{B_G}{pY} = \frac{\frac{D}{pY}}{\hat{p} + \hat{Y}} .$$

With a constant government deficit-GDP ratio and a constant nominal rate of growth of the economy, the government debt-GDP ratio will thus converge towards a definite value.

The government deficit can now be decomposed into a primary deficit (D') and the interest payments on the stock of government debt (iB_G):

(4.44) $$D = D' + iB_G .$$

Inserting this into equation (4.43) yields:

(4.45) $$\frac{B_G}{pY} = \frac{\frac{D' + iB_G}{pY}}{\hat{p} + \hat{Y}} .$$

With a balanced primary budget, $D' = 0$, and hence $D = iB$, governments can thus service their debt by their current government deficits, and stabilise the government debt-GDP ratio – provided that nominal GDP growth is positive.

Rearranging equation (4.44) gives:

$$(4.46)\quad \frac{B_G}{pY} = \frac{\frac{D'}{pY}}{\hat{Y}+\hat{p}-i} = \frac{\frac{D'}{pY}}{\hat{Y}+\hat{p}-\left(i_r+\hat{p}\right)} = \frac{\frac{D'}{pY}}{\hat{Y}-i_r}.$$

If the growth rate of nominal GDP exceeds the nominal interest rate on government debt, governments can also run a primary deficit-GDP ratio without compromising a long-run stable government debt-GDP ratio. However, if nominal GDP growth falls short of the nominal rate of interest, stabilising the government debt-GDP ratio will require a primary surplus in the government budget – and thus implies the use of tax revenues in order to satisfy the income demands of the rentiers holding government debt.

➔ coordination with central banks keeping targeting long-term interest rate below growth

4.5 AN OPEN ECONOMY MODEL WITH CONSTANT PRICES

4.5.1 The basic model

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Table 4.9: Balance sheet matrix for an open economy with a government and a central bank

	Workers' households	Rentiers' households	Firms	Government	Commercial banks	Central bank	Rest of the world (RoW)	Σ
Money/ Reserves		$+M_R$			$+M_B$	$-M$		0
Deposits		$+D_R$			$-D_R$			0
Loans		$+B_{FR}+B_{GR}+B_{RoWR}$	$-(B_{FR}+B_{FB}+B_{FRoW})$	$-(B_{GR}+B_{GB})$	$+b(B_{FB}+B_{GB})$	$+(1-b)(B_{FB}+B_{GB})$	$B_{FRoW}-B_{RoWR}$	0
Capital			pK					pK
Σ	0	$+B_{FR}+B_{GR}+B_{RoWR}+D_R+M_R$	$+E_F$	$-(B_{GR}+B_{GB})$	0	0	$B_{FRoW}-B_{RoWR}$	$pK = E_F+B_{FR}+B_{FRoW}+D_R+M_R-B_{GB} = E_F+B_{FR}+B_{FB}+B_{FRoW}$

Domestic firms may be indebted with the RoW

Domestic households may hold claims against the RoW

The consistency of the balance sheet matrix requires

$$(4.47)\quad pK = E_F + B_{FR} + B_{FRoW} + D_R + M_R - B_{GB} = E_F + B_{FR} + B_{FB} + B_{FRoW}\,.$$

Table 4.10: Transaction flow matrix for an open economy with a government and a central bank

	Workers' households	Rentiers' households	Firms' current	Firms' capital	Government	Commercial banks	Central bank	Rest of the world (RoW)	Σ
Taxes	$-T_W$	$-T_R$	$-T_F$		$+T$				0
Government consumption			$+G$		$-G$				0
Consumption	$-pC_W$	$-pC_R$	$+pC_W+pC_R$						0
Investment			$+pI$	$-pI$					0
Exports			$+pEx$					$-pEx$	
Imports			$-p_f aIm$					$+p_f aIm$	
Wages	$+W$		$-W$						0
Retained profits			$-\Pi_F$	$+dE_F$					0
Interest payments		$+R_{FR}+R_{GR}+R_{RoWR}$	$-(R_{FR}+R_{FRoW})$		$-R_{GR}$			$+R_{FRoW}$ $-R_{RoWR}$	0
Change in Money/Reserves		$-dM_R$				$-dM_B$	$+dM$		0
Change in deposits		$-dD_R$				$+dD_R$			
Change in loans		$-dB_{FR}-dB_{GR}$ $-dB_{RoWR}$		$+dB_{FR}+dB_{FB}$ $+dB_{FRoW}$	$+B_{GR}+B_{GB}$	$-bd(B_{FB}+B_{GB})$	$-(1-b)$ $d(B_{FB}+B_{GB})$	$+dB_{FRoW}$ $-dB_{RoWR}$	0
Σ	0	0	0	0	0	0	0	0	0

For consistency, we need for the relationship between the domestic economy and the RoW:

$$\text{(4.48)} \quad pEx - p_f a\,Im + R_{RoWR} - R_{FRoW} = dB_{RoWR} - dB_{FRoW}\,.$$

Assumptions of model
(short run version of Hein/Vogel 2008)

- Imported raw materials
- Output competes in international markets
- Prices of imported inputs and competing foreign output are given
- Nominal exchange rate is given, determined by monetary policies and financial markets
- Foreign economic activity is given
- Net international investment position of the domestic economy is zero, hence no cross-border interest payments
- No government debt, no taxes, only defict financed expenditures

4.5.2 Prices, distribution and international competitiveness

(4.49) $$p = \left[1 + m(i)\right]\left(\frac{w}{y} + p_f a\mu\right), \qquad m > 0, \frac{\partial m}{\partial i} \geq 0 .$$

p: domestic prices, m: mark-up, w: nominal wage rate, a: exchange rate, p_f: prices of imported foreign goods in foreign currency , e: nominal exchange rate, μ: raw material-output ratio

The relationship between unit material costs and unit labour costs (z) becomes:

(4.50) $$z = \frac{p_f a\mu}{\frac{w}{y}} .$$

(4.51) $$p = (1+m)\frac{w}{y}\left(1 + \frac{p_f a\mu}{\frac{w}{y}}\right) = (1+m)\frac{w}{y}(1+z) .$$

The profit share (h) in domestic value added:

$$(4.52)\quad h = \frac{\Pi}{pY} = \frac{\Pi}{\Pi + W} = \frac{m\frac{w}{y}(1+z)}{m\frac{w}{y}(1+z)+\frac{w}{y}} = \frac{m(1+z)}{m(1+z)+1} = \frac{1}{\frac{1}{m(1+z)}+1}.$$

Wage share in domestic value added:

$$(4.53)\quad \Omega = 1 - h = \frac{W}{pY} = \frac{W}{\Pi + W} = \frac{\frac{w}{y}}{m\frac{w}{y}(1+z)+\frac{w}{y}} = \frac{1}{m(1+z)+1}.$$

We choose the real exchange rate (a_r) as an indicator for international competitiveness:

(4.54) $$a_r = \frac{ap_f}{p}.$$

An increase in the real exchange rate implies increasing international price competitiveness of domestic producers. From equation (4.53), it follows for the respective growth rates:

(4.55) $$\hat{a}_r = \hat{a} + \hat{p}_f - \hat{p}.$$

(4.54a) $$\frac{\partial a_r}{\partial m} = \frac{-ap_f\left(\frac{w}{y} + p_f a\mu\right)}{p^2} < 0\,.$$

(4.54b) $$\frac{\partial a_r}{\partial w} = \frac{-ap_f\,(1+m)\frac{1}{y}}{p^2} < 0\,.$$

(4.54c) $$\frac{\partial a_r}{\partial a} = \frac{p_f p - ap_f\,(1+m)\,p_f\mu}{p^2} = \frac{p-(1+m)\mu a p_f}{\frac{p^2}{p_f}} > 0\,.$$

Changes in the domestic profit share may either be associated with declining or improving international competitiveness:

(4.56) $$a_r = a_r(h), \qquad \frac{\partial a_r}{\partial h} > 0,\ \text{if}\ \ dz > 0\ \text{and}\ \ dm = 0,$$
$$\frac{\partial a_r}{\partial h} < 0,\ \text{if}\ \ dz = 0\ \text{and}\ \ dm > 0.$$

4.5.3 The goods market equilibrium and the effects of changes in model parameters

(4.57) $$S = \Pi - R + S_R = hpY - \left(1 - s_R\right) iB_F, \quad 1 \geq s_R > 0.$$

(4.58) $$pI = pI_a + \beta pY - \theta iB_F, \; pI_a, \beta, \theta \geq 0$$

(4.59) $$NX = pEx - ap_f \; Im = \psi a_r \left(h\right) + \chi p_f aY_f - \phi pY, \psi, \phi, \chi \geq 0$$

(4.60) $$pI + G + NX = S,$$

(4.61) $$\frac{\partial S}{\partial \left(pY\right)} > \frac{\partial \left(pI\right)}{\partial \left(pY\right)} + \frac{\partial NX}{\partial \left(pY\right)} \Rightarrow h - \beta + \phi > 0.$$

(4.62) $$pY^* = \frac{G + pI_a + (1 - s_R - \theta)iB_F + \psi a_r + \chi p_f a Y_f}{h - \beta + \phi},$$

(4.63) $$pI^* = \frac{pI_a(h + \phi) + \beta(G + \psi a_r + \chi p_f a Y_f) + [\beta(1 - s_R) - \theta(h + \phi)]iB_F}{h - \beta + \phi},$$

(4.64) $$\Pi^* = \frac{h[G + pI_a + (1 - s_R - \theta)iB_F + \psi a_r + \chi p_f a Y_f]}{h - \beta + \phi},$$

(4.65) $$NX^* = \frac{(h - \beta)(\psi a_r + \chi p_f a Y_f) - \phi[G + pI_a + (1 - s_R - \theta)iB_F]}{h - \beta + \phi}$$

Figure 4.12: Short-run equilibrium income in an open economy with a government

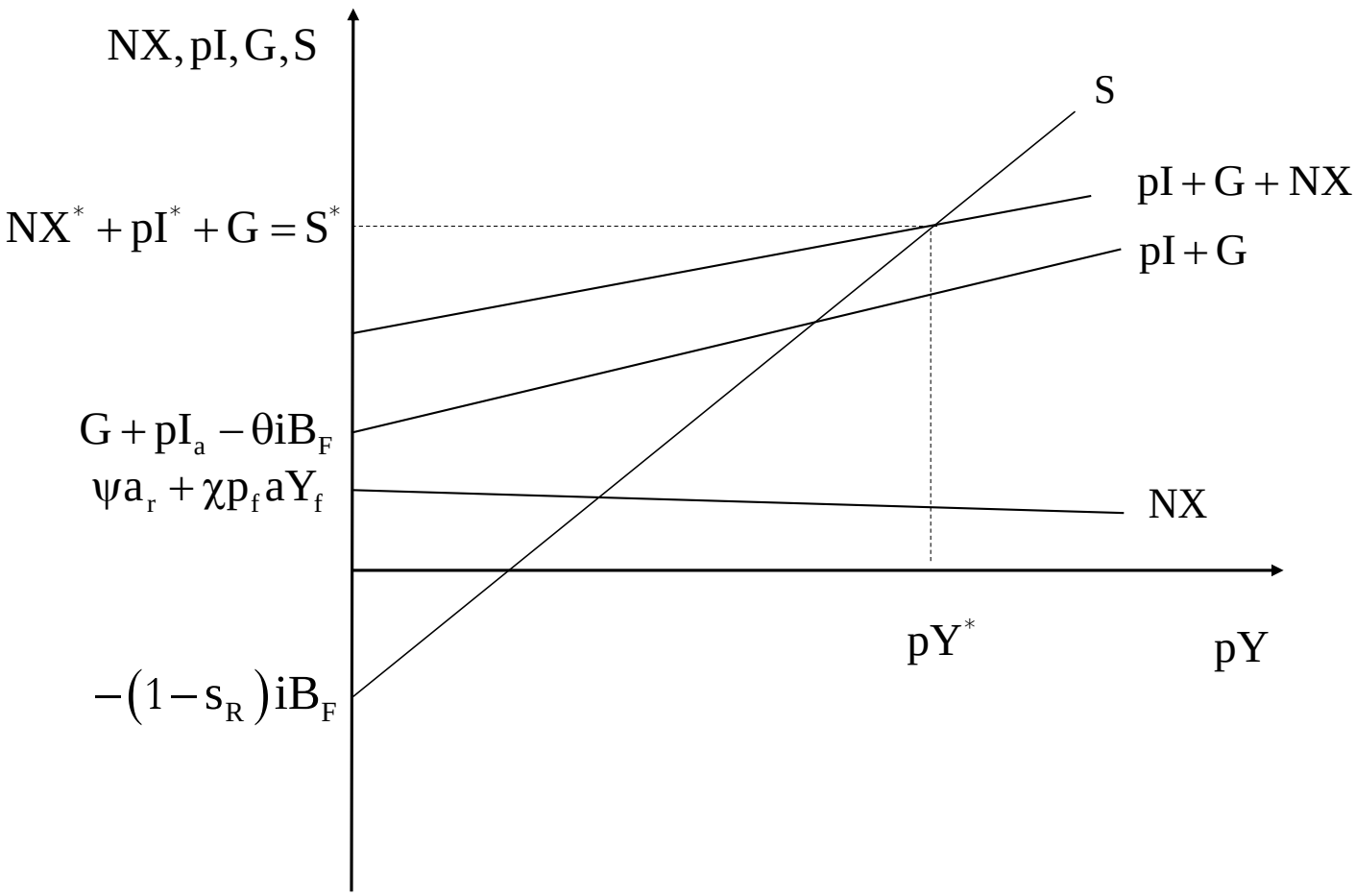


Figure 4.13: An increase in animal spirits/autonomous investment

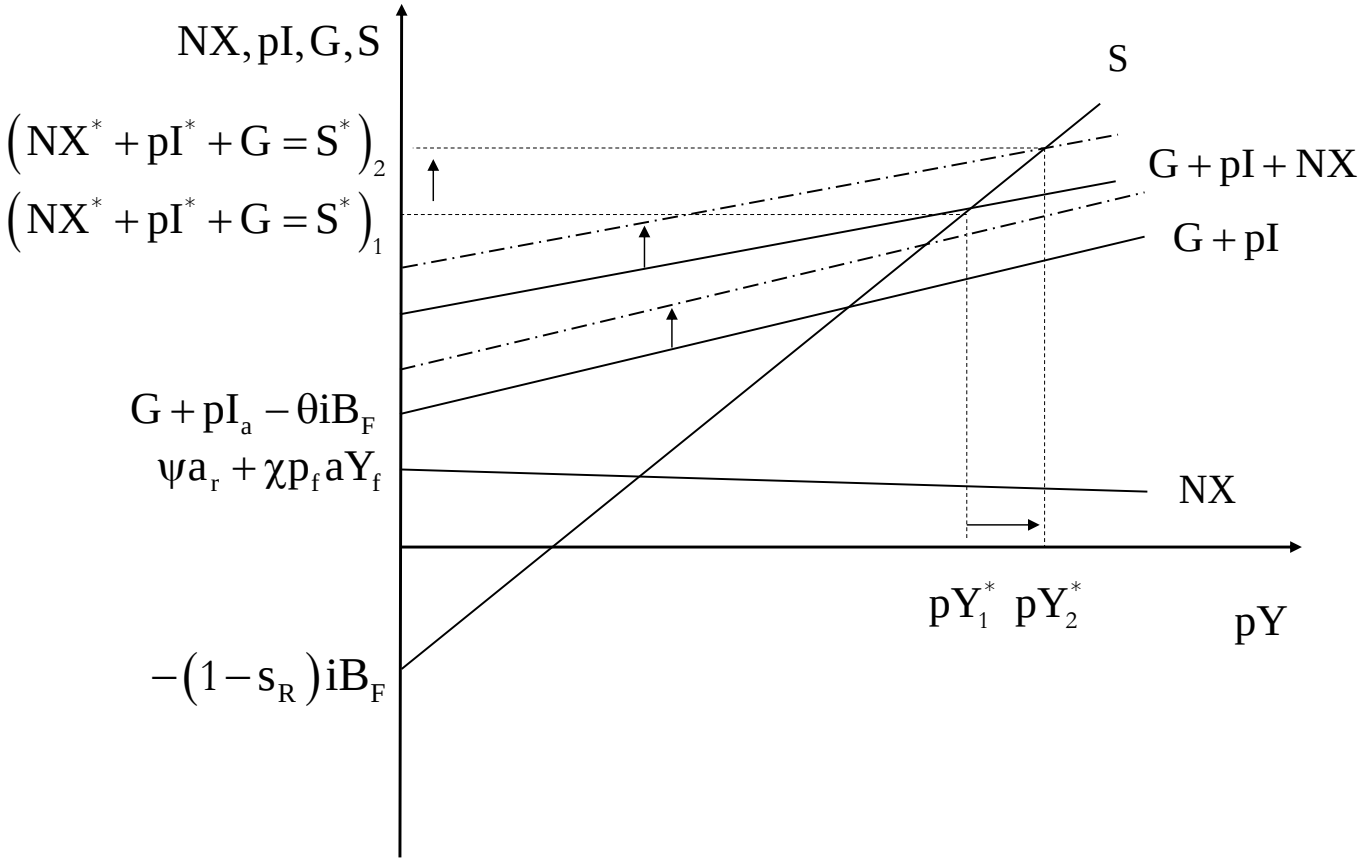
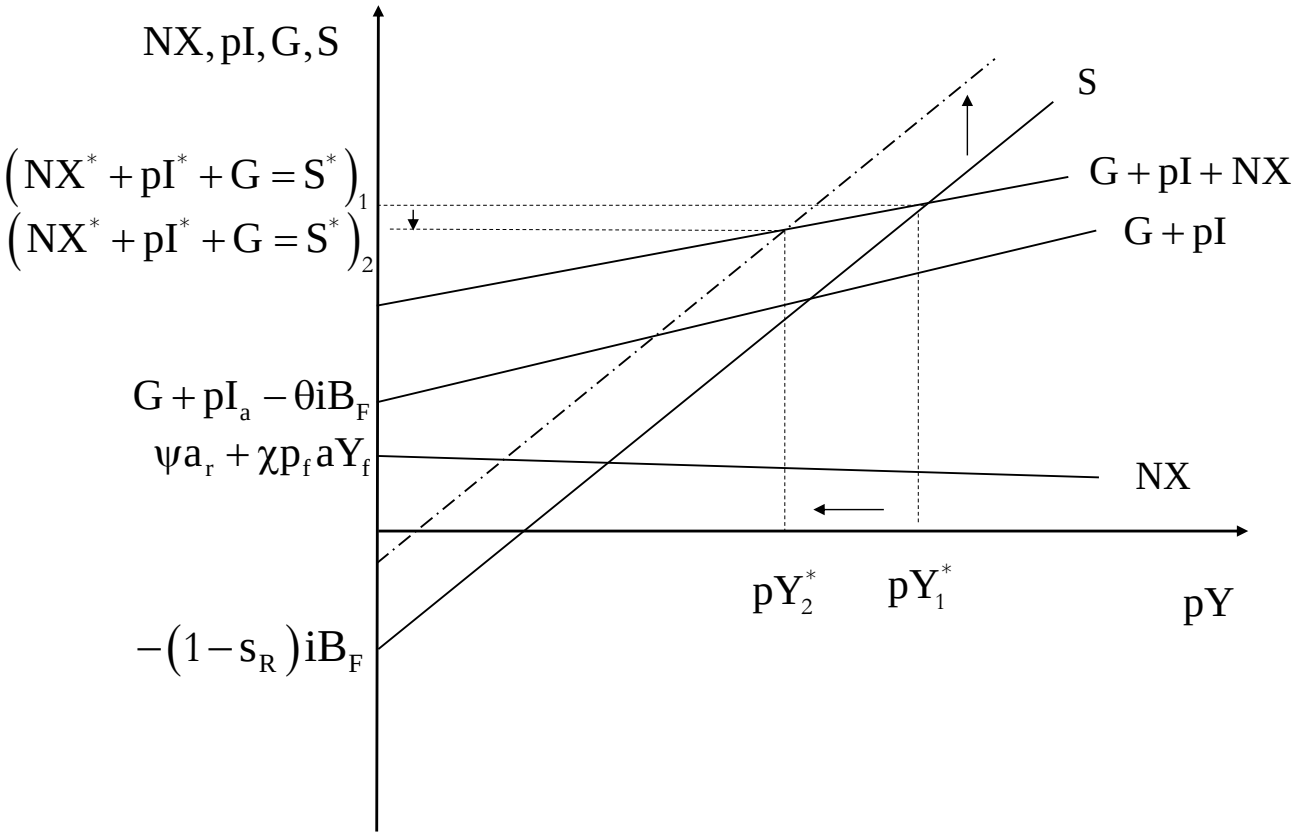


Figure 4.14: An increase in the propensity to save out of profits



For the effects of redistribution of income the open economy model does not generate unique results any more:

(4.62a)
$$\frac{\partial\left(pY^{*}\right)}{\partial h}=\frac{\psi\frac{\partial a^{r}}{\partial h}\left(h-\beta+\phi\right)-\left[G+pI_{a}+\left(1-s_{R}-\theta\right)iB_{F}+\psi a_{r}+\chi p_{f}aY_{f}\right]}{\left(h-\beta+\phi\right)^{2}}$$
$$=\frac{\psi\frac{\partial a_{r}}{\partial h}-pY^{*}}{h-\beta+\phi}$$

(4.63a)
$$\frac{\partial\left(pI^{*}\right)}{\partial h}=\frac{\beta\left\{\psi\frac{\partial a_{r}}{\partial h}\left(h-\beta+\phi\right)-\left[G+pI_{a}+\left(1-s_{R}-\theta\right)iB_{F}+\psi a_{r}+\chi p_{f}aY_{f}\right]\right\}}{\left(h-\beta+\phi\right)^{2}}$$
$$=\frac{\beta\left(\psi\frac{\partial a_{r}}{\partial h}-pY^{*}\right)}{h-\beta+\phi}$$

(4.64a)
$$\frac{\partial \Pi^*}{\partial h} = \frac{h\psi \frac{\partial a_r}{\partial h}(h-\beta+\phi)+(\phi-\beta)\left[G+pI_a+(1-s_R-\theta)iB_F+\psi a_r+\chi p_f a Y_f\right]}{(h-\beta+\phi)^2}$$
$$= \frac{h\psi \frac{\partial a_r}{\partial h}+(\phi-\beta)pY^*}{h-\beta+\phi},$$

(4.65a)
$$\frac{\partial NX^*}{\partial h} = \frac{(h-\beta)\psi \frac{\partial a_r}{\partial h}(h-\beta+\phi)+\phi\left[G+pI_a+(1-s_R-\theta)iB_F+\psi a_r+\chi p_f a Y_f\right]}{(h-\beta+\phi)^2}$$
$$= \frac{(h-\beta)\psi \frac{\partial a_r}{\partial h}+\phi pY^*}{h-\beta+\phi}.$$

Figure 4.15: An increase in the profit share associated with improved international price competitiveness – wage led total demand

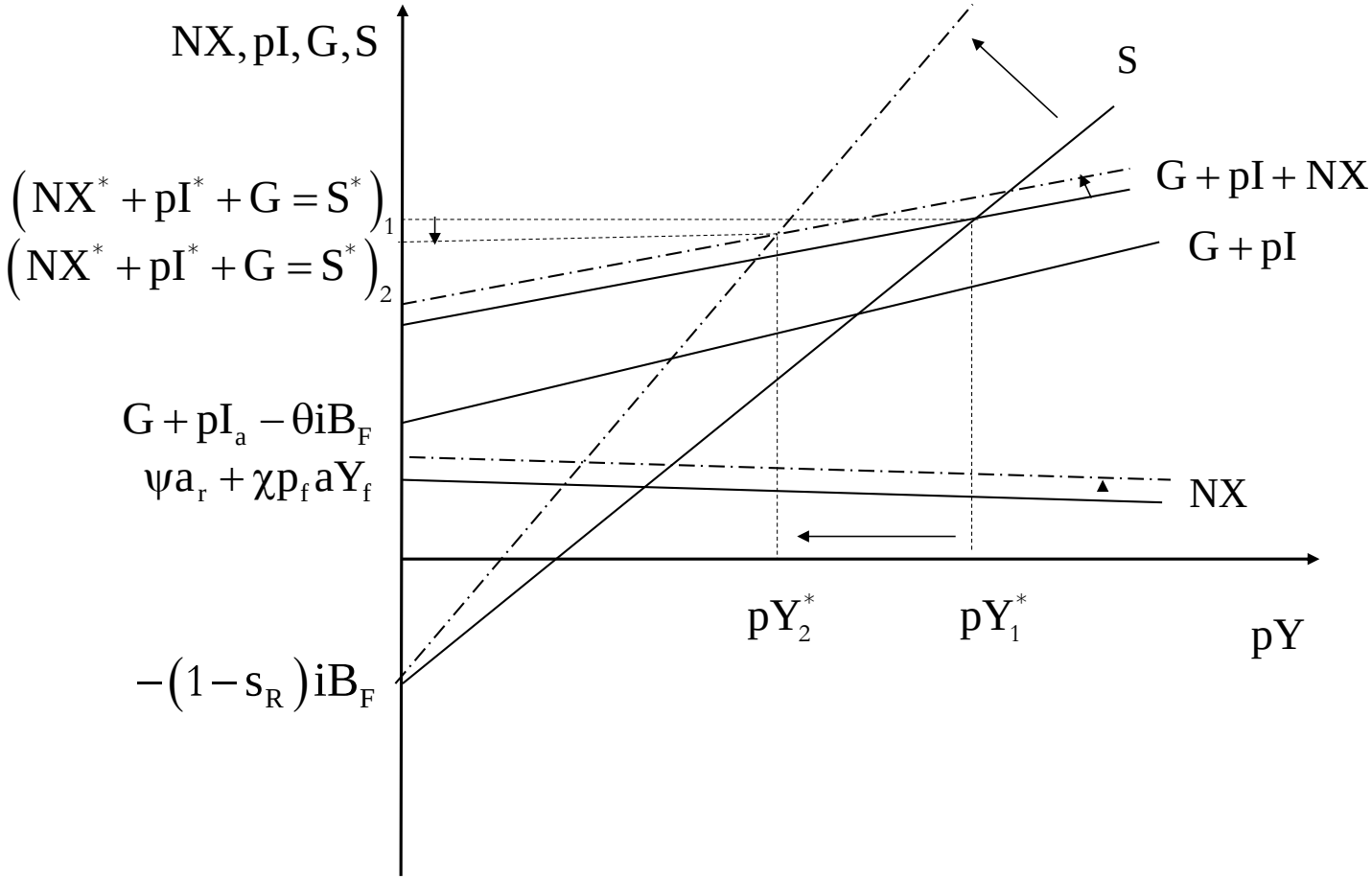


Figure 4.16: An increase in the profit share associated with improved international price competitiveness – profit-led total demand

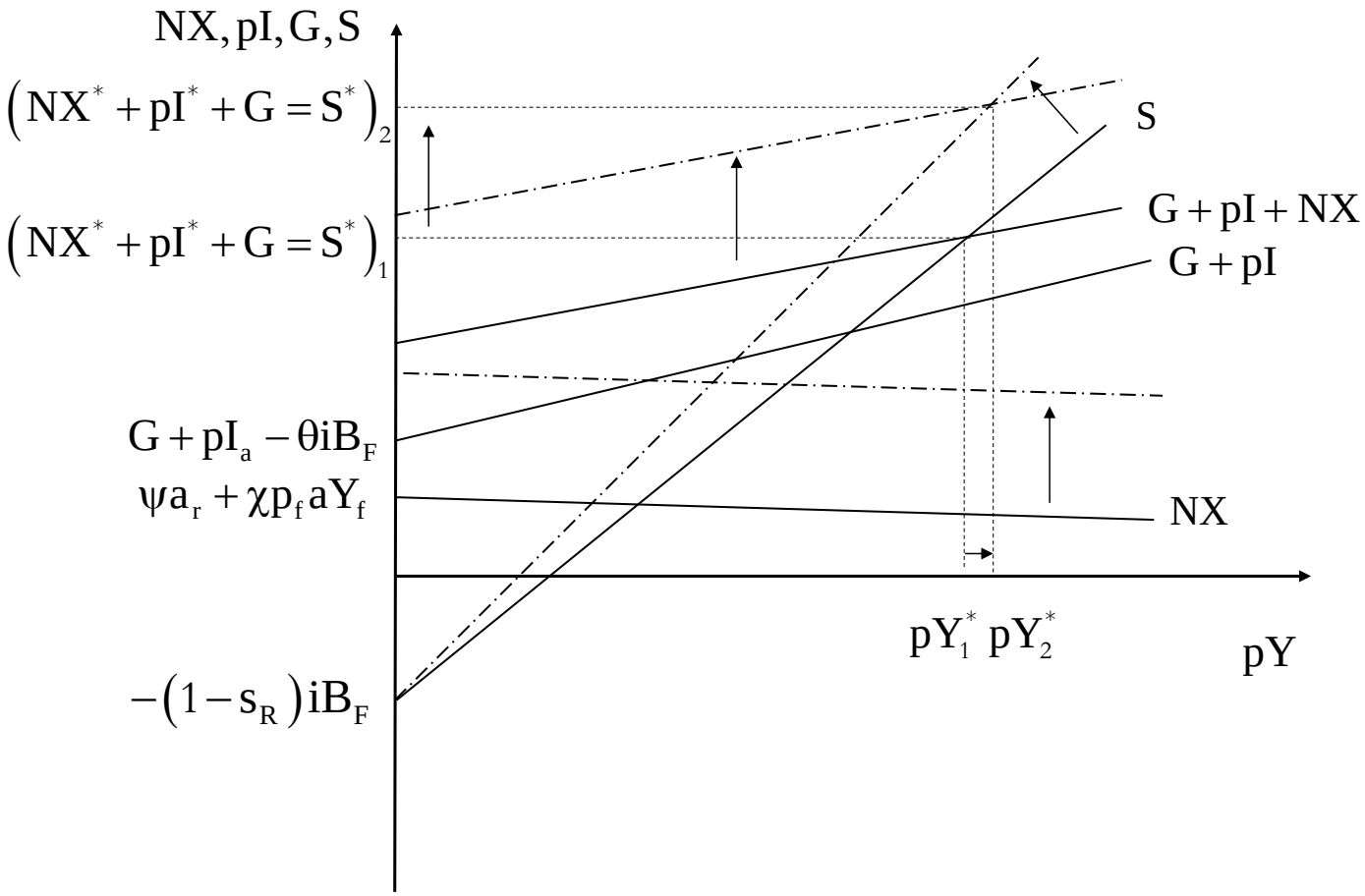
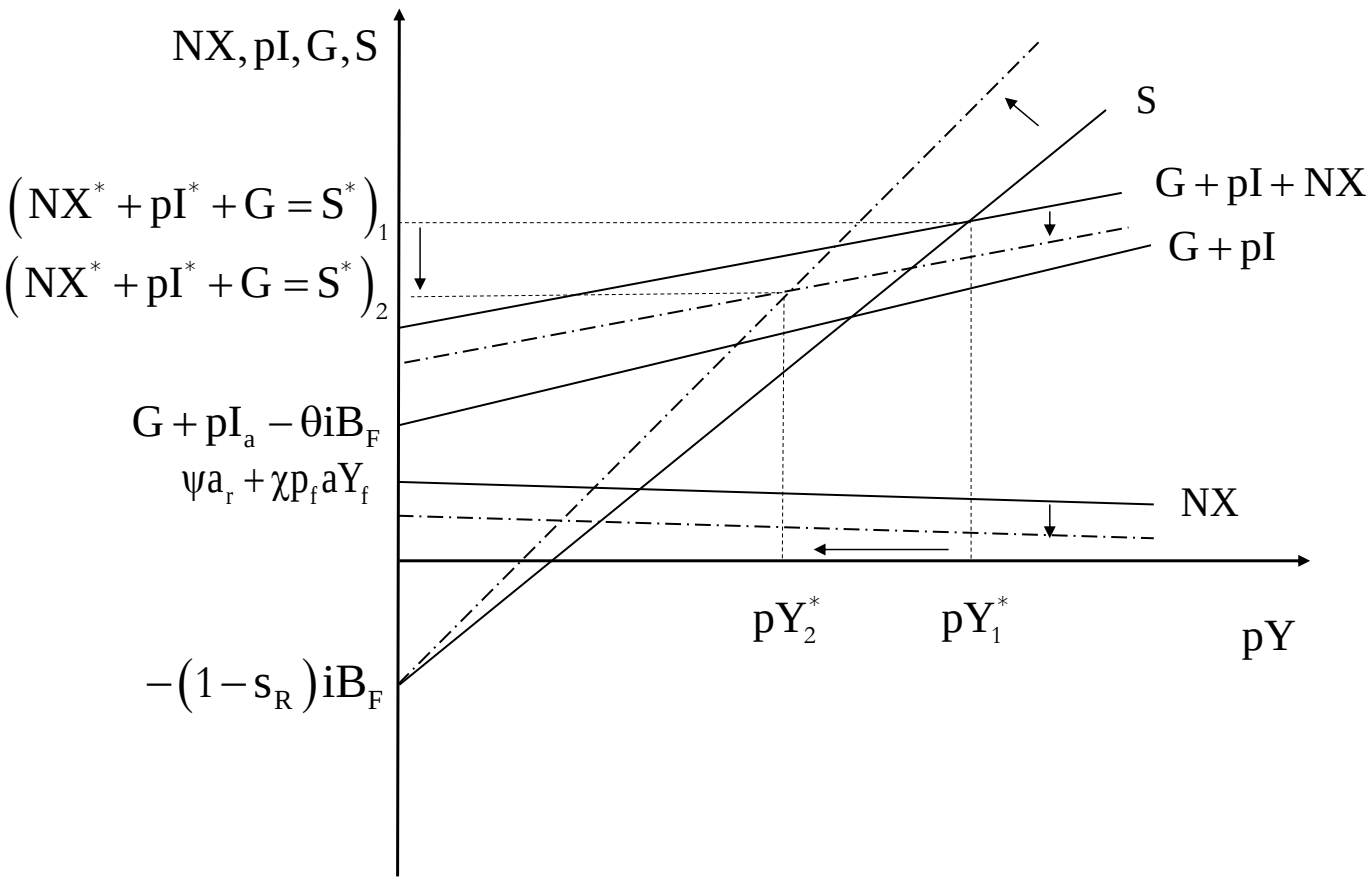


Figure 4.17: An increase in the profit share associated with a fall in international price competitiveness



Macroeconomic effects of real devaluation of the domestic currency:

- Policies of real devaluation which improve international price competitiveness of domestic firms – either by means of nominal devaluation of the domestic currency or by wage cuts – will only stimulate aggregate demand, output and employment, if the economy is in a profit-led demand regime.

- However, if the economy is in a wage-led regime, policies of real devaluation might stimulate net exports but the associated re-distribution of income will have overall depressive effects on aggregate demand, output and employment – and also on investment in the capital stock

Response of equilibrium income towards a rise in the nominal exchange rate, i.e. a devaluation of the domestic currency:

(4.62b)
$$\frac{\partial\left(pY^*\right)}{\partial a}=\frac{\left(\psi\frac{\partial a_r}{\partial a}+\chi p_f Y_f\right)\left(h-\beta+\phi\right)-\left[G+pI_a+\left(1-s_R-\theta\right)iB_F+\psi a_r+\chi p_f aY_f\right]\frac{\partial h}{\partial a}}{\left(h-\beta+\phi\right)^2}$$
$$=\frac{\psi\frac{\partial a_r}{\partial a}+\chi p_f Y_f-pY^*\frac{\partial h}{\partial a}}{h-\beta+\phi}$$

Effects of changes in the exogenous interest rate on the equilibrium values of income, investment, profits and net exports:

(4.62c) $$\frac{\partial\left(pY^*\right)}{\partial i}=\frac{\left(1-s_R-\theta\right)B_F-\frac{\partial h}{\partial i}pY^*+\frac{\partial a_r}{\partial h}\frac{\partial h}{\partial i}\psi}{h-\beta+\phi},$$

(4.63b) $$\frac{\partial\left(pI^*\right)}{\partial i}=\frac{\left[\beta\left(1-s_R-\theta\right)-\theta\left(h+\phi\right)\right]B_F-\frac{\partial h}{\partial i}\beta pY^*+\frac{\partial a_r}{\partial h}\frac{\partial h}{\partial i}\beta\psi}{h-\beta+\phi},$$

(4.64b) $$\frac{\partial\Pi^*}{\partial i}=\frac{\left(1-s_R-\theta\right)B_F-\frac{\partial h}{\partial i}\left(\beta-\phi\right)pY^*+\frac{\partial a_r}{\partial h}\frac{\partial h}{\partial i}h\psi}{h-\beta+\phi},$$

(4.65b) $$\frac{\partial NX^*}{\partial i}=\frac{-\left(1-s_R-\theta\right)\phi B_F+\frac{\partial h}{\partial i}\phi pY^*+\frac{\partial a_r}{\partial h}\frac{\partial h}{\partial i}\left(h-\beta\right)\psi}{h-\beta+\phi}.$$

In the open economy model we have three channels for the effects of changes in the interest rate on the goods market equilibrium.

- First, there is the effect via the redistribution of income between rentiers (creditors) and firms (debtors), which is represented by the first term in the numerators of equations (4.62c) – (4.64b).
- Second, we may have a positive effect of a rising interest rate on the profit share, with a negative effect on equilibrium income, investment and profits, and a positive effect on net exports. This effect can be seen in the second term in the numerators of equations (4.62c) – (4.64b).
- Third, as shown in the third terms of the numerators of equations (4.62c) – (4.64b), a change in the profit share triggered by a change in the interest rate will also be associated with a change in the real exchange rate and hence in international price competitiveness of domestic producers, which will then also affect the equilibrium values of income, investment, profits and net exports.

Higher (lower) interest rates will have expansionary (contractionary) effects on equilibrium income, investment and profits – and cause lower (higher) net exports:

- if the puzzling case conditions for the effect of changes of interest rates on domestic demand with constant profit shares prevail,
- if the distributional effects of changes in interest rates on wage and profit shares are small,
- and if the effect of the associated real appreciation of the domestic currency on net exports is small, too.

Contractionary (expansionary) effects of higher (lower) interest rates on equilibrium income, investment and profits – and higher (lower) net exports will dominate:

- if the normal case conditions for the effect of changes of interest rates on domestic demand with constant profit shares prevail,
- and/or if the distributional effects of changes in interest rates on wage and profit shares are high
- and/or if the effect of the associated real appreciation of the domestic currency on net exports is strong.

Table 4.11: Responses of equilibrium output/income, investment, profits and net exports towards changes in exogenous variables and parameters

	pY^*	pI^*	Π^*	NX^*
G	+	+	+	–
pI_a	+	+	+	–
s_R	–	–	–	+
h	+/–	+/–	+/–	–/+
a	+/–	+/–	+/–	+
p_f	+	+	+	+
Y_f	+	+	+	+
i	+/–	+/–	+/–	–/+
B_F	+/–	+/–	+/–	–/+

4.6 MACROECONOMIC EFFECTS OF WAGE INEQUALITY

- So far: distribution between labour and capital, and between firms and rentiers, or debtors and creditors.

- Other post-Keynesian work: managers vs. shareholders (Dutt 2016, Hein 2012, 2014b, Chapter 10), overhead labour vs. direct labour (Lavoie 1995a, 1996c, 2009b, Rowthorn 1981)

- Now: models allowing for a division of the working class into high and low wage earners, the latter potentially emulating consumption behaviour of the former financed by increasing indebtedness under certain conditions – also a feature of finance-dominated capitalism

4.6.1 Kaleckian/post-Keynesian macroeconomic models with different types of workers

- Palley (2005, 2015c, 2015d, 2017): introduction of a wage bill division between workers and managers can render an economy profit-led with respect to the profit share, but wage-led with respect to the workers' share of the wage bill.
- Wage dispersion together with interdependent consumption and financing norms of households (Detzer 2018, Kapeller and Schütz 2014, 2015, Kapeller et al. 2018, Kim et al. 2014, Setterfield and Kim 2016, Setterfield et al. 2016, Zezza 2008, ...).
- Veblen's (1899) 'conspicuous consumption', Duesenberry's (1949) 'relative income hypothesis' and the 'expenditure cascades' proposed by Frank et al. (2014)
- Kapeller and Schütz (2015): a *consumption-driven profit-led regime* ; Minskyan financial instability
- Carvalho and Rezai (2016), Prante (2018): wage inequality and propensity to save out of wages

4.6.2. A simple macroeconomic model with wage inequality and potential relative income effects on consumption

- closed private one good economy
- constant coefficient production technology
- no overheads, no depreciation of the capital stock
- no explicit creditor-debtor relationship
- workers save with differential saving rates out of wages
- inequality of wages are associated with profit share (Glyn 2006, Tridico 2017).

Profit share (h) is determined by mark-up (m) pricing on unit variable costs consisting only of unit direct labour costs

(4.66) $$\mathrm{h} = \mathrm{h}(\bar{\mathrm{m}}), \qquad \frac{\partial \mathrm{h}}{\partial \mathrm{m}} > 0 .$$

Wage inequality (Γ), is affected by the profit share:

(4.67) $$\Gamma = \Gamma(\mathrm{h}), \qquad \frac{\partial \Gamma}{\partial \mathrm{h}} \geq 0 .$$

The propensity to save out of wage income (s_W) is co-determined by wage inequality.

(4.68) $s_W = s_{W0} - \eta\Gamma, \qquad 0 \leq s_{W0} < 1.$

- If $\eta = 0$, wage inequality has no effect on the average propensity to save out of wages; high and low wage earners have the same propensity to save.
- If $\eta < 0$, we have a 'normal' or usually expected effect of inequality on consumption/saving out of wages due to absolute income effects. A rise in wage inequality will raise the average propensity to save out of wage income
- If $\eta > 0$, we have 'puzzling' or unexpected effects of inequality on consumption/saving out of wages, due to the persistence of basic needs of low income workers, relative income considerations, improved access to credit and/or wealth effects on consumption.

(4.69) $$S = s_\Pi \Pi + s_W W = \left[s_\Pi h + \left(s_{W0} - \eta\Gamma \right)\left(1-h\right) \right] pY, \qquad s_\Pi > s_{W0} - \eta\Gamma .$$

(4.70) $$pI = pI_a + \beta pY, \qquad pI_a, \beta > 0$$

(4.71) $$pI = S$$

(4.72) $$\frac{\partial S}{\partial (pY)} - \frac{\partial (pI)}{\partial (pY)} > 0 \quad \Rightarrow \quad s_\Pi h + \left(s_{W0} - \eta\Gamma \right)\left(1-h\right) - \beta > 0 .$$

(4.73) $$pY^* = \frac{pI_a}{s_\Pi h + \left(s_{W0} - \eta\Gamma \right)\left(1-h\right) - \beta},$$

(4.74) $$pI^* = S^* = \frac{pI_a \left[s_\Pi h + \left(s_{W0} - \eta\Gamma \right)\left(1-h\right) \right]}{s_\Pi h + \left(s_{W0} - \eta\Gamma \right)\left(1-h\right) - \beta} .$$

(4.73a)
$$\frac{\partial (pY)^*}{\partial h} = \frac{-pI_a\left[s_\Pi - (s_{W0} - \eta\Gamma) - (1-h)\eta\frac{\partial\Gamma}{\partial h}\right]}{\left[s_\Pi h + (s_{W0} - \eta\Gamma)(1-h) - \beta\right]^2}$$
$$= \frac{-pY^*\left[s_\Pi - (s_{W0} - \eta\Gamma) - (1-h)\eta\frac{\partial\Gamma}{\partial h}\right]}{s_\Pi h + (s_{W0} - \eta\Gamma)(1-h) - \beta}$$

(4.73a')
$$\frac{\partial (pY)^*}{\partial h} > 0, \quad \text{if}: s_\Pi - (s_{W0} - \eta\Gamma) - (1-h)\eta\frac{\partial\Gamma}{\partial h} < 0,$$

(4.74a)
$$\frac{\partial (pI)^*}{\partial h} = \frac{-\beta p I_a \left[s_\Pi - (s_{W0} - \eta\Gamma) - (1-h)\eta \frac{\partial \Gamma}{\partial h} \right]}{\left[s_\Pi h + (s_{W0} - \eta\Gamma)(1-h) - \beta \right]^2}$$
$$= \frac{-\beta p Y^* \left[s_\Pi - (s_{W0} - \eta\Gamma) - (1-h)\eta \frac{\partial \Gamma}{\partial h} \right]}{s_\Pi h + (s_{W0} - \eta\Gamma)(1-h) - \beta}$$

(4.74a')
$$\frac{\partial (pI)^*}{\partial h} > 0, \qquad \text{if}: s_\Pi - (s_{W0} - \eta\Gamma) - (1-h)\eta \frac{\partial \Gamma}{\partial h} < 0 .$$

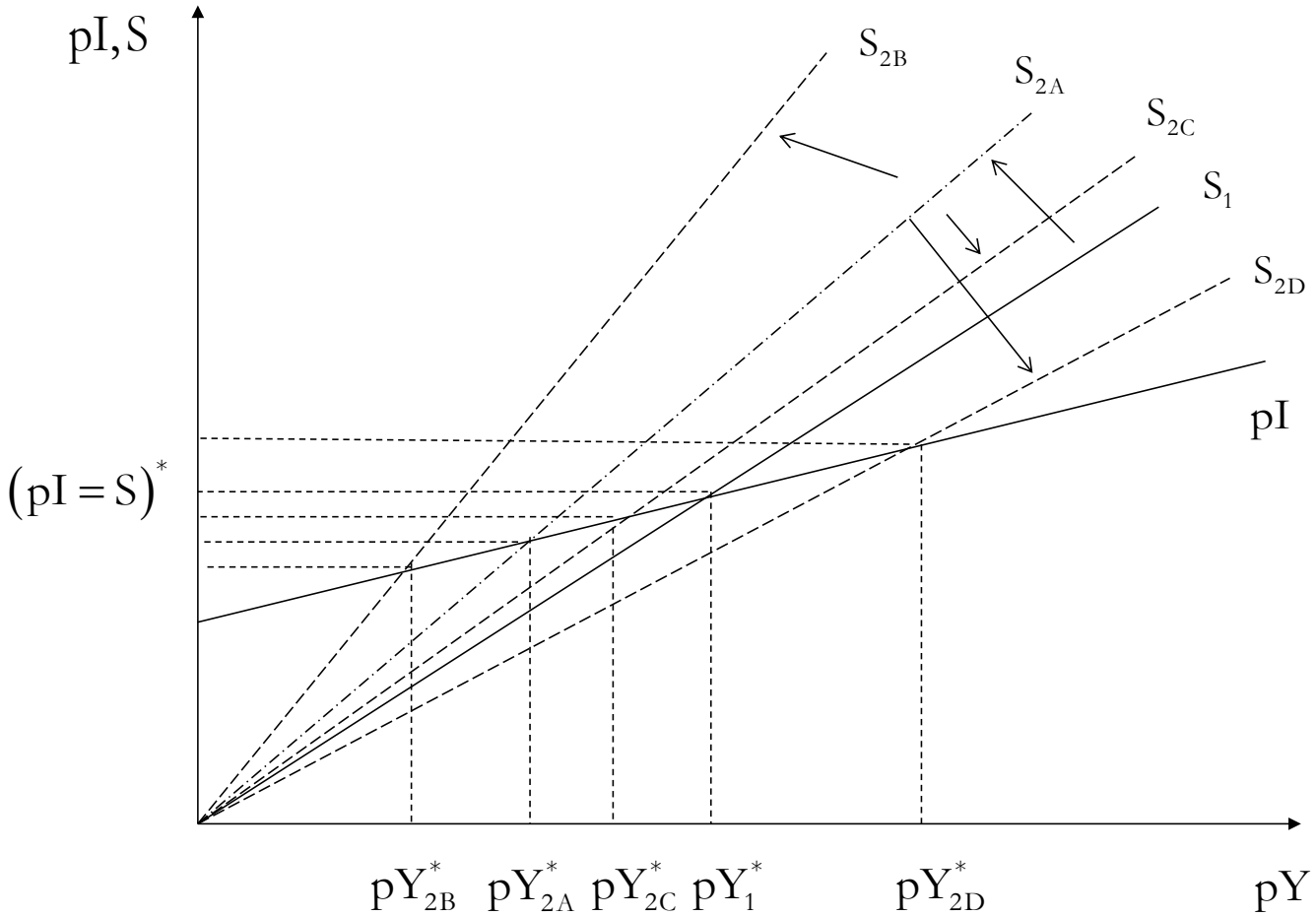
The effect of a rise in the profit share on the goods market equilibrium can be decomposed into the primary effect via a change in functional income shares and a secondary effect via induced changes in wage inequality.

Primary effect is always negative

Secondary effect depends on η

- If $\eta < 0$, average propensity to save out of wages rises and contraction is accelerated
- If $\eta > 0$, average propensity to save out of wages falls and dampens or reverses contraction. 'Seemingly profit-led' regimes based on relative income effects and rising indebtedness may emerge

Figure 4.18: Potential effects of a rise in the profit share with relative income effects on consumption



- Taking into account personal income or wage distribution together with basic needs, relative income concerns, credit availability or wealth effects, a basically wage-led demand economy may turn seemingly profit-led.

- However, rising consumption in the face of falling wage shares and rising income/wage inequality is difficult to sustain due to the associated indebtedness problems

- Sustainable development has to rely on income-financed consumption demand, and here functional income shares matter again. If absolute income effects dominate finally, it is not only income shares, but also wage dispersion which matter.

- Palley (2017): Even if an economy were profit-led via an investment channel, as in Bhaduri and Marglin (1990) and Kurz (1990), or via a net export channel, as in Blecker (1989), and in our open economy model, reducing wage dispersion would still be a reliable and sustainable way of boosting aggregate demand, output, income and employment

4.7 MACROECONOMIC EFFECTS OF GENDER WAGE GAPS

4.7.1 Gender and macroeconomics

Integrating gender issues into post-Keynesian/Kaleckian macroeconomic models links post-Keynesian economics and feminist economics:

- reproduction of labour into macroeconomic models, focusing on the disproportional share of women as compared to men in unpaid reproductive and care work (Braunstein et al. 2011, 2020)
- gender inequality and growth in developing countries, further taking into account the specific structural features of these economies, like a dual production structure, segregated labour markets, the balance-of-payments constraint, ... (Blecker/Seguino 2002, Seguino 2010, 2012, 2019a)
- Onaran (2015) and Onaran et al. (2019) have integrated several of these features into a more general gendered macroeconomic model on Kaleckian grounds, which has then also been estimated for the UK
- Here: more basic introduction of gender wage-gap into basic neo-Kaleckian model, focusing on distribution and aggregate demand

➢ short-run version of Hein (2020)

4.7.2 The closed economy model

Basic structure

- Closed economy without a government sector, two classes, capitalists and workers (male and female), who are in excess supply.
- Homogenous output (Y) for consumption and investment purposes is produced combining direct male or female labour and a non-depreciating capital stock (K), no overhead labour, no intermediate products, fixed coefficient production technology.
- Capitalists receive profits, which they partly consume and partly save—buying assets issued by the corporate sector and thus the capitalists themselves or depositing parts of the profits with a banking sector, which is also owned by the capitalists.
- Investment in the capital stock is not constrained by saving at the macroeconomic level

Workers are split into male workers (N_M) and female workers (N_F), whereas no gender division is assumed for the capitalist class. Employment (N) thus consists of a male ($\rho = N_M / N$) and a female share ($1-\rho = N_F / N$)

(4.75) $$N = \rho N + (1-\rho) N .$$

Male and female workers operate the same technology and thus have the same labour productivity ($y = Y/N$):

(4.76) $$\frac{Y}{N} = \frac{Y_M}{N_M} = \frac{Y_F}{N_F} = y = y_M = y_F ,$$

with Y_M and Y_F denoting male and female output.

Because of historically, socially and institutionally given discrimination of women, nominal wages for female work (w_F) will only be a fraction of nominal wages for male work (w_M):

(4.77) $$w_F = \varepsilon w_M, \qquad 0 < \varepsilon \leq 1.$$

Therefore, we have ε as a gender equality parameter and (1-ε) for the gender wage gap.

Nominal income (pY), i.e. real income/output multiplied by the price level, is distributed between male wages (W_M), female wages (W_F) and profits (Π):

(4.78) $$pY = W_M + W_F + \Pi = w_M N_M + w_F N_F + rpK = w_M \left[\rho + \varepsilon(1-\rho)\right] N + rpK.$$

Pricing and distribution

(4.79) $$p = (1+m)\frac{W_M + W_F}{Y} = (1+m)\frac{w_M N_M + w_F N_F}{Y} = (1+m)\frac{w_M\left[\rho + \varepsilon(1-\rho)\right]}{y}, \quad m > 0 .$$

From equation (4.79) we get that profits are given by:

(4.80) $$\Pi = m\left(w_M N_M + w_F N_F\right) = m w_M\left[\rho + \varepsilon(1-\rho)\right]N .$$

For the profit share in nominal income we thus obtain:

$$(4.81) \quad h = \frac{\Pi}{pY} = \frac{\Pi}{W_M + W_F + \Pi} = \frac{m w_M \left[\rho + \varepsilon(1-\rho)\right] N}{(1+m) w_M \left[\rho + \varepsilon(1-\rho)\right] N} = \frac{m}{1+m}.$$

For the aggregate wage share (Ω) this means:

$$(4.82) \quad \Omega = 1 - h = \frac{W_M + W_F}{pY} = \frac{W_M + W_F}{W_M + W_F + \Pi} = \frac{w_M \left[\rho + \varepsilon(1-\rho)\right]}{(1+m) w_M \left[\rho + \varepsilon(1-\rho)\right]} = \frac{1}{1+m}.$$

The male (Ω_M) and the female (Ω_F) share of wages in national income are:

$$(4.83) \quad \Omega_M = \frac{W_M}{pY} = \frac{W_M}{W_M + W_F + \Pi} = \frac{w_M \rho}{(1+m) w_M \left[\rho + \varepsilon(1-\rho)\right]} = \Omega \frac{\rho}{\rho + \varepsilon(1-\rho)}.$$

$$(4.84) \quad \Omega_F = \frac{W_F}{pY} = \frac{W_F}{W_M + W_F + \Pi} = \frac{w_M \varepsilon(1-\rho)}{(1+m) w_M \left[\rho + \varepsilon(1-\rho)\right]} = \Omega \frac{\varepsilon(1-\rho)}{\rho + \varepsilon(1-\rho)}.$$

The wage shares of male and female workers therefore depend on the overall wage share and the respective gender shares in this overall wage share. These shares are affected by the share of male and female workers in the total labour force and by the gender wage equality parameter, and hence by the gender wage gap.

An improvement towards gender wage equality and a reduction in the gender wage gap will have the following effects on income distribution:

(4.81a) $$\frac{\partial h}{\partial \varepsilon} = 0,$$

(4.82a) $$\frac{\partial \Omega}{\partial \varepsilon} = 0,$$

(4.83a) $$\frac{\partial \Omega_M}{\partial \varepsilon} = \frac{-\Omega\rho(1-\rho)}{\left[\rho+\varepsilon(1-\rho)\right]^2} = \frac{-\rho(1-\rho)}{(1+m)\left[\rho+\varepsilon(1-\rho)\right]^2} < 0,$$

(4.84a) $$\frac{\partial \Omega_F}{\partial \varepsilon} = \frac{\Omega\rho(1-\rho)}{\left[\rho+\varepsilon(1-\rho)\right]^2} = \frac{\rho(1-\rho)}{(1+m)\left[\rho+\varepsilon(1-\rho)\right]^2} > 0.$$

Distribution, aggregate demand and output

(4.85) $$pI = pI_a + \beta pY, \qquad pI_a, \beta > 0$$

Aggregate saving (S) consists of saving out of profit (S_Π), saving out of male workers' wages (S_{WM}) and saving out of female workers' wages (S_{WF}). Each saving aggregate is determined by the respective propensity to save and the respective income, with s_Π denoting the propensity to save out profits, s_{WM} the propensity to save out of male wages and s_{WF} the propensity to save out of female wages:

(4.86) $$S = S_\Pi + S_{WM} + S_{WF} = \left(s_\Pi h + s_{WM}\Omega_M + s_{WF}\Omega_F\right)pY, \qquad 0 \le s_{WM}, s_{WF} < s_\Pi \le 1.$$

- Whether the propensity to save out of female wages is higher or lower than the propensity to save out of male wages is an open question.
- On the one hand, female wages are lower than male wages and, according to Keynes's (1936, Chapter 8) absolute income hypothesis, we would expect a higher propensity to consume and thus a lower propensity to save out of female wages than out of male wages, as also expected by Onaran (2015).
- On the other hand, it has been found by Seguino/Sagrario Floro (2003) for semi-industrialised countries that higher relative income and more bargaining power of women increase aggregate saving rates, because women's income is more unstable and women's expenditures are dominated more by pre-cautionary motives.
- Interestingly, the estimations by Onaran et al. (2019) for the UK support the notion that the propensity to save out of female wages is higher than out of male wages.

➔ In our following analysis, we will therefore consider both cases: $s_{WM} > s_{WF}$ and $s_{WM} < s_{WF}$.

Plugging in the determination of the male and female wage shares from equations (4.83) and (4.84) into equation (4.86) we obtain:

$$(4.87) \quad S = \left\{ h\left[s_{\Pi} - \frac{s_{WM}\rho + s_{WF}\varepsilon(1-\rho)}{\rho + \varepsilon(1-\rho)} \right] + \left[\frac{s_{WM}\rho + s_{WF}\varepsilon(1-\rho)}{\rho + \varepsilon(1-\rho)} \right] \right\} pY \,.$$

The average propensity to save out of wages (s_W) is the weighted average of the propensity to save out of male and female wages, with weights given by the male and female share in wages:

$$(4.88) \quad s_W = \frac{S_W}{W} = \frac{S_{WM} + S_{WF}}{W_M + W_F} = \frac{s_{WM}\Omega_M pY + s_{WF}\Omega_F pY}{\Omega pY} = \frac{s_{WM}\rho + s_{WF}\varepsilon(1-\rho)}{\rho + \varepsilon(1-\rho)} \,.$$

Using equation (4.87), the saving equation thus turns to:

(4.89) $$S = \left\{ h\left[s_{\Pi} - s_{W}(\varepsilon) \right] + s_{W}(\varepsilon) \right\} pY \, .$$

(4.88a) $$\frac{\partial s_{W}}{\partial \varepsilon} = \frac{-(1-\rho)\rho\left(s_{WM} - s_{WF}\right)}{\left[\rho + \varepsilon(1-\rho)\right]^{2}} \, .$$

(4.90) $pI = S$.

(4.91) $$\frac{\partial S}{\partial (pY)} - \frac{\partial (pI)}{\partial (pY)} > 0 \quad \Rightarrow \quad h(s_\Pi - s_W) + s_W - \beta > 0.$$

(4.92) $$pY^* = \frac{pI_a}{h(s_\Pi - s_W) + s_W - \beta}.$$

(4.93) $$pI^* = S^* = \frac{pI_a\left[h(s_\Pi - s_W) + s_W\right]}{h(s_\Pi - s_W) + s_W - \beta}.$$

(4.94) $$\Pi^* = \frac{hpI_a}{h(s_\Pi - s_W) + s_W - \beta}.$$

For the improvement towards gender wage equality and a reduction in the gender wage gap, we obtain:

(4.92b) $$\frac{\partial(pY)^*}{\partial\varepsilon} = \frac{\alpha(1-h)(1-\rho)\rho(s_{WM}-s_{WF})}{\left\{\left[h(s_\Pi - s_W)+s_W-\beta\right]\left[\rho+\varepsilon(1-\rho)\right]\right\}^2},$$

(4.93b) $$\frac{\partial(pI)^*}{\partial\varepsilon} = \frac{\beta\alpha(1-h)(1-\rho)\rho(s_{WM}-s_{WF})}{\left\{\left[h(s_\Pi - s_W)+s_W-\beta\right]\left[\rho+\varepsilon(1-\rho)\right]\right\}^2},$$

(4.94b) $$\frac{\partial\Pi^*}{\partial\varepsilon} = \frac{h\alpha(1-h)(1-\rho)\rho(s_{WM}-s_{WF})}{\left\{\left[h(s_\Pi - s_W)+s_W-\beta\right]\left[\rho+\varepsilon(1-\rho)\right]\right\}^2}.$$

- Demand may thus be ‚gender equality-led' or ‚gender equality-burdened'!

4.7.3 The open economy model

Basic structure

- Based on open economy model in Section 4.5
- Model economy without economic activity of the state, which is open to foreign trade, but not to international movements of capital and labour
- The economy depends on imported inputs for production purposes and its output competes in international markets
- Prices of imported inputs and of the competing foreign final output to be exogenously given
- The nominal exchange rate, the relationship between domestic currency and foreign currency or the price of a unit of foreign currency in domestic currency, is determined by monetary policies and international financial markets and is also considered to be exogenous.
- Foreign economic activity is also taken to be exogenously given

Pricing, distribution and international competitiveness

Unit raw material and semi-finished product inputs per unit of output: μ, the nominal exchange rate: a, price of a unit of imported foreign goods in foreign currency: p_f.:

(4.95) $$p = (1+m)\left\{\frac{w_M\left[\rho+\varepsilon(1-\rho)\right]}{y} + p_f a\mu\right\}, \qquad m > 0\,.$$

(4.96) $$z = \frac{p_f a\mu y}{w_M\left[\rho+\varepsilon(1-\rho)\right]}\,.$$

(4.97) $$p = (1+m)\frac{w_M\left[\rho+\varepsilon(1-\rho)\right]}{y}(1+z)\,.$$

(4.98) $$h = \frac{\Pi}{W_M + W_F + \Pi} = \frac{(1+z)m}{1+(1+z)m}.$$

(4.99) $$\Omega = 1 - h = \frac{W_M + W_F}{W_M + W_F + \Pi} = \frac{1}{1+(1+z)m},$$

(4.100) $$\Omega_M = \frac{W_M}{W_M + W_F + \Pi} = \Omega \frac{\rho}{\rho + \varepsilon(1-\rho)} = \frac{\rho}{\left[1+(1+z)m\right]\left[\rho + \varepsilon(1-\rho)\right]},$$

(4.101) $$\Omega_F = \frac{W_F}{W_M + W_F + \Pi} = \Omega \frac{\varepsilon(1-\rho)}{\theta + \varepsilon(1-\rho)} = \frac{\varepsilon(1-\rho)}{\left[1+(1+z)m\right]\left[\theta + \varepsilon(1-\rho)\right]}.$$

(4.96a) $$\frac{\partial z}{\partial \varepsilon} = \frac{-p_f e \mu y (1-\rho)}{w_M \left[\rho + \varepsilon(1-\rho)\right]^2} = \frac{-(1-\rho) z}{\left[\rho + \varepsilon(1-\rho)\right]} < 0 .$$

(4.98a) $$\frac{\partial h}{\partial \varepsilon} = \frac{-m(1-\rho) z}{\left[1+(1+z)m\right]^2 \left[\rho + \varepsilon(1-\rho)\right]} < 0 ,$$

(4.99a) $$\frac{\partial \Omega}{\partial \varepsilon} = \frac{(1-\rho) m z}{\left[1+(1+z)m\right]^2 \left[\rho + \varepsilon(1-\rho)\right]} > 0 ,$$

(4.100a) $$\frac{\partial \Omega_M}{\partial \varepsilon} = \frac{-(1-\rho)\rho(1+m)}{\left\{\left[1+(1+z)m\right]\left[\rho + \varepsilon(1-\rho)\right]\right\}^2} < 0 ,$$

(4.101a) $$\frac{\partial \Omega_F}{\partial \varepsilon} = \frac{(1-\rho)\left\{\rho(1+m) + mz\left[\rho + \varepsilon(1-\rho)\right]\right\}}{\left\{\left[1+(1+z)m\right]\left[\rho + \varepsilon(1-\rho)\right]\right\}^2} > 0 .$$

The real exchange rate (a_r) is the indicator for international competitiveness:

(4.102) $$a_r = \frac{ap_f}{p}.$$

(4.103) $$\hat{a}_r = \hat{a} + \hat{p}_f - \hat{p}.$$

The reduction of the gender wage gap and a rise of the gender wage equality parameter have a uniquely negative effect on international price competitiveness:

(4.102a) $$\frac{\partial a_r}{\partial \varepsilon} = \frac{-(1-\rho)p_f a\mu y}{(1+m)w_M\left\{(1+z)\left[\rho+\varepsilon(1-\rho)\right]\right\}^2} = \frac{-(1-\rho)a_r}{(1+z)\left[\rho+\varepsilon(1-\rho)\right]} < 0.$$

Distribution, aggregate demand and income/output

(4.104) $S = pI + pEx - ap_f\ Im = pI + NX.$

(4.105) $NX = pEx - ap_f\ Im = \psi a_r(\varepsilon) + \chi ap_f Y_f - \phi pY, \qquad \psi, \phi, \chi \geq 0,$

(4.85) $pI = pI_a + \beta pY, \qquad pI_a, \beta > 0$

(4.89) $S = S_\Pi + S_{WM} + S_{WF} = (s_\Pi h + s_{WM}\Omega_M + s_{WF}\Omega_F)pY, \qquad 0 \leq s_{WM}, s_{WF} < s_\Pi \leq 1.$

(4.106) $\dfrac{\partial S}{\partial(pY)} - \dfrac{\partial(pI)}{\partial(pY)} - \dfrac{\partial NX}{\partial(pY)} > 0 \quad \Rightarrow \quad h(s_\Pi - s_W) + s_W - \beta + \phi > 0.$

Plugging equations (4.85), (4.89) and (4.105) into equation (4.104) and solving for domestic income and then using equilibrium domestic income to determine the equilibrium levels of investment, profits and net exports yields the following results:

$$(4.107)\ pY^* = \frac{pI_a + \psi a_r + \chi a p_f Y_f}{h(s_\Pi - s_W) + s_W - \beta + \phi},$$

$$(4.108)\ pI^* = \frac{pI_a\left[h(s_\Pi - s_W) + s_W + \phi\right] + \beta\left[\psi a_r + \chi a p_f Y_f\right]}{h(s_\Pi - s_W) + s_W - \beta + \phi},$$

$$(4.109)\ \Pi^* = \frac{h\left(pI_a + \psi a_r + \chi a p_f Y_f\right)}{h(s_\Pi - s_W) + s_W - \beta + \phi},$$

$$(4.110)\ NX^* = \frac{\left(\psi a_r + \chi a p_f Y_f\right)\left[h(s_\Pi - s_W) + s_W - \beta\right] - pI_a\phi}{h(s_\Pi - s_W) + s_W - \beta + \phi}.$$

For the effects of an improvement towards gender wage equality and a reduction in the gender wage gap, we obtain:

(4.107a)
$$\frac{\partial (pY)^*}{\partial \varepsilon} = \frac{\frac{\partial a_r}{\partial \varepsilon}\psi - (pY)^*\left[\frac{\partial h}{\partial \varepsilon}(s_\Pi - s_W) + \frac{\partial s_W}{\partial \varepsilon}(1-h)\right]}{h(s_\Pi - s_W) + s_W - \beta + \phi},$$

(4.108a)
$$\frac{\partial (pI)^*}{\partial \varepsilon} = \frac{\beta\left\{\frac{\partial a_r}{\partial \varepsilon}\psi - (pY)^*\left[\frac{\partial h}{\partial \varepsilon}(s_\Pi - s_W) + \frac{\partial s_W}{\partial \varepsilon}(1-h)\right]\right\}}{h(s_\Pi - s_W) + s_W - \beta + \phi},$$

(4.109a)
$$\frac{\partial \Pi^*}{\partial \varepsilon} = \frac{h\left\langle \frac{\partial a_r}{\partial \varepsilon}\psi - (pY)^*\left\{\frac{\partial h}{\partial \varepsilon}\left[s_\Pi - s_W - \frac{1}{h}\left(h(s_\Pi - s_W) + s_W - \beta + \phi\right)\right] + \frac{\partial s_W}{\partial \varepsilon}(1-h)\right\}\right\rangle}{h(s_\Pi - s_W) + s_W - \beta + \phi},$$

(4.110a)
$$\frac{\partial NX^*}{\partial \varepsilon} = \frac{\frac{\partial a_r}{\partial \varepsilon}\psi\left[h(s_\Pi - s_W) + s_W - \beta\right] + \phi(pY)^*\left[\frac{\partial h}{\partial \varepsilon}(s_\Pi - s_W) + \frac{\partial s_W}{\partial \varepsilon}(1-h)\right]}{h(s_\Pi - s_W) + s_W - \beta + \phi}.$$

- First, we have the channel via international price competitiveness of domestic producers ($\partial a_r / \partial \varepsilon$) which affects foreign demand for domestically produced goods and hence exports.

- Second, we have the channel via the profit share ($\partial h / \partial \varepsilon$)

- Third, there is the channel via gender wage distribution and the average propensity to consume out of wages ($\partial s_W / \partial \varepsilon$), which will each affect domestic demand.

- For the interpretation of our results, we have to remember that we assume the stability condition for the goods market equilibrium in (4.106) to hold, which means that the denominators in equations (4.107a) – (4.110a) are all positive. From equation (4.98a) we have $\partial h / \partial \varepsilon < 0$ and from equation (4.102a) we know that $\partial e^r / \partial \varepsilon < 0$. Furthermore, from equation (4.88a) we know that $\partial s_W / \partial \varepsilon < 0, \text{ if } s_{WM} > s_{WF}$ and $\partial s_W / \partial \varepsilon > 0, \text{ if } s_{WM} < s_{WF}$.

***Case 1*: $s_{WM} > s_{WF}$ and $\partial s_W / \partial \varepsilon < 0$**

- Domestic demand will rise whenever the gender wage gap is reduced, because the profit share falls and also the average propensity to save out of wages declines.
- However, the effect on foreign demand and exports will be negative, because of a declining real exchange rate.
- The effect on total demand will depend on the relative strengths of these effects.

If the expansionary effect on domestic demand dominates the contractionary effect on foreign demand, the numerators in equations 4.107a) and (4.108a) will be positive and total demand will rise and will hence be gender equality-led. This is the more likely:

- the lower the price elasticity of exports,
- the lower the effect of reducing the gender wage gap is on the real exchange rate,
- the higher the differential in the propensities to save out profits and out of aggregate wages are,
- the lower the profit share,
- and the stronger the negative effects of an improvement of the gender wage equality are on the profit share and on the average propensity to save out of wages.

***Case 2*: $s_{WM} < s_{WF}$ and $\partial s_W / \partial \varepsilon > 0$:**

- The effect of lowering the gender wage gap on domestic demand may but need be be negative, if the dampening effect via the increase in the average propensity to save out of wages exceeds the expansionary effect via the reduction in the profit share.
- If the term $(\partial h/\partial \varepsilon)(s_\Pi - s_W) + (\partial s_W/\partial \varepsilon)(1-h)$ in the numerators of equations (4.106a) and (4.107a) turns positive, the numerators will be negative and we will see lower equilibrium income.
- Even if $(\partial h/\partial \varepsilon)(s_\Pi - s_W) + (\partial s_W/\partial \varepsilon)(1-h)$ remains negative, it may be overcompensated by the effect decreasing the gender pay gap on price competitiveness.
- Demand will be gender equality-burdened. The effect on the equilibrium net export rate may be positive or negative, as already mentioned above.

Although a gender equality-led regime is logically not impossible, if the propensity to save out of female wages is higher than out of male wages, it is less likely in this case. If the propensity to save out of female wages is lower than out of male wages, a gender equality-led regime is a very likely outcome, in particular if the depressive real appreciation-export effect is not too strong relative to the expansionary domestic demand effect.