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Kaleckian models of conflict inflation, distribution and employment: a comparative analysis

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Abstract
This paper conducts a systematic comparison of two main textbook variants within the Kaleckian tradition of post-Keynesian conflict inflation and distribution theory: the Blecker/Setterfield (2019) and Lavoie (1992, 2022) (BSL) model based on Dutt (1987), and the Hein (2023a) and Hein/Stockhammer (2011) (HS) model founded on Rowthorn (1977). Focusing on a basic closed economy framework sans government, we explore various iterations of each approach. Our analysis reveals that disparities chiefly centre around the treatment of price inflation expectations ('indexation') and the incorporation of bargaining power in wage- and price-inflation equations. BSL variants generally yield stable price Phillips curves, stable distribution and employment curves, and hence stable equilibria. Only the BSL-3 variant with complete indexation and complete pass-through generates shifting Phillips and employment curves, implying instability. It is thus similar to the HS-0 approach, which has bargaining power and complete indexation representing adaptive expectations in wage inflation and incomplete pass-through in price inflation. Introducing a workers' wage share target directly into the wage-inflation equation, but keeping full indexation/adaptive expectations in wage inflation and incomplete pass-through in price inflation, allows for stable and even flat Phillips curves, stable distribution and employment curves, and hence stable equilibria in the HS approach.

JEL code: E12, E24, E25, E31
Key words: conflict inflation, employment, distribution, post-Keynesian models

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1. Introduction

In the post-Keynesian conflict theory of inflation, we can distinguish two basic traditions, the Keynes (1930, 1936), Kaldor (1955/56, 1957), Robinson (1956, 1962) and Marglin (1984) tradition, and the Kalecki (1954, 1971), Rowthorn (1977) and Dutt (1987) tradition.[1] In each tradition, persistent inflation arises because of conflicting income claims, as Kaldor (1959) pointed out, and may then be modified by inflation expectations. In the basic closed economy model version, these conflicting claims are the capitalists' profit share claims and the workers' wage share claims. The first post-Keynesian inflation theory tradition assumes normal rates of capacity in long-run growth and flexible goods market prices.[2] Capitalists' profit share claims vary directly with excess demand in the goods market, while workers' wage share claims are determined by a constant conventional real wage, or they may vary with economic activity and capitalists' profits. The second tradition allows for variable rates of capacity utilisation beyond the short run; changes in demand thus cause changes in output and capacity utilisation.[3] Prices in oligopolistic or monopolistic industry and service sectors are set by firms following some cost-plus pricing strategy. Only in the primary sector with inelastic supply, changes in demand trigger changes in prices. Target profit shares of firms are thus mainly affected by those factors, which determine their cost-plus pricing in the goods market. In Kaleckian mark-up pricing on constant unit variable costs (Kalecki 1954: chs. 1-2, 1971: chs. 5-6), these are the degree of price competition, overhead costs and the bargaining power of trade unions. Furthermore, the ratio of unit raw material and semi-finished costs to unit direct wage costs and the sectoral composition of the economy matter for the economy-wide target profit share of firms.

In this Kalecki, Rowthorn and Dutt tradition, two prototype conflict inflation and distribution models for the closed economy without a government have been proposed.[4] The first is based on Dutt (1987), and can be found in the textbooks by Blecker/Setterfield (2019) and Lavoie (1992, 2022) (BSL). It derives a stable upwards sloping Phillips curve and a stable profit-squeeze distribution curve. The second is based on Rowthorn (1977) and is incorporated in Hein/Stockhammer (2009, 2011) and Hein (2023a) (HS). Here, inflation and distribution are only constant at the employment rate providing consistent income claims, the stable inflation rate of employment (SIRE), while inconsistent claims generate changes in inflation and distribution, with destabilising feedback effects on aggregate demand and employment. These different results are based on the different ways income claims of capitalists and workers, as well as inflation expectations (indexation), are modelled in the wage- and price-inflation equations. In this paper we will provide a systematic comparison of these two

[1] See Hein (2023b) for a systematic comparison of the two traditions of post-Keynesian inflation theory and their implications for the analysis of the increase in inflation in the course of the recovery from the Covid-19 recession and the Russian war in Ukraine since 2021.

[2] For presentations of the Kaldor-Robinson first generation post-Keynesian distribution and growth models, see Blecker/Setterfield (2019: ch. 3), Hein (2014: ch. 4), and Lavoie (2022: ch. 6), for example.

[3] For presentations of the Kalecki-Steindl post-Keynesian distribution and growth models, see Blecker/Setterfield (2019: ch. 4), Hein (2014: chs. 5-11), and Lavoie (2022: ch. 6).

[4] For open economy versions of the prototype models, see Lavoie (2022: ch. 8) and Hein (2023a: ch. 5). See also Bastian/Setterfield (2020), Blecker (2011), Sasaki et al. (2013), and Vera (2014).

approaches, based on Hein (2023a: ch. 5), and we will provide several variations of each of the prototypes. These show how slight variations in the specification of wage- and price-inflation equations can lead to different results regarding the Phillips curve, distribution curve, employment curve and the type of the respective (dis-)equilibria. The main contribution of this paper is thus didactic and pedagogic and should help to clarify the major differences between these approaches.

In what follows, in Section 2 we will present the foundations of each of the prototype approaches and the basic model assumptions for their comparison. Section 3 will then present the two prototypes, the BSL-0 and the HS-0 models. In Section 4 we will provide three variations of the BSL model, while Section 5 contains three variations of the HS model. Section 6 will compare and assess these variations, and Section 7 will summarise and conclude.

2. Foundations of the prototype approaches and basic model assumptions for comparison

The BSL approach of modelling distribution conflict, inflation, distribution, and demand and employment in a post-Keynesian/Kaleckian framework is based on Dutt's (1987) critique of Marglin's (1984) model, which is in the Keynes, Kaldor and Robinson tradition. Dutt criticised Marglin's model for not allowing for variations in capacity utilisation and thus excluding the possibility of wage-led demand and growth by design. Dutt (1987) then provided the foundations for later, more elaborate work by Cassetti (2002, 2003), Dutt (1992), Palley (2007, 2012), Rochon/Setterfield (2007), Setterfield (2009, 2023), and others. The main features, distinguishing this approach from the alternative HS approach based on Rowthorn (1977), are that inflation expectations have no or only incomplete effects in the wage- and price-inflation equations of the models. Lavoie (1992: 393) calls this incomplete 'indexation'. Inconsistent claims generate constant inflation or deflation and constant functional distribution at any rate of employment. Consistent claims generate constant prices and hence zero inflation. Textbook versions of the BSL approach can be found in Blecker/Setterfield (2019: ch. 5) and Lavoie (1992: ch. 7, 2022: ch. 8).

The alternative HS approach of modelling inflation, distribution and employment is based on Rowthorn (1977). Similar approaches have then been used by Arestis/Sawyer (2005), Hein (2006), Hein/Stockhammer (2010), Lavoie (2006), Sawyer (2002), and Stockhammer (2008), for example. The main feature of this approach, as compared to the BSL variant, is the focus on adaptive inflation expectations of workers in the wage-inflation equation. Inconsistent distribution claims generate unexpected (or 'unanticipated' in Rowthorn 1977) (dis-)inflation and changes in distribution at any rate of employment.[5] Only with consistent claims, constant inflation and constant distribution are generated. There is hence always an inflation barrier, a 'non-accelerating inflation rate of unemployment' (NAIRU) or a 'stable inflation rate of employment' (SIRE). However, in this approach, although 'there is a NAIRU at

[5] Rowthorn (1977) distinguishes two regimes. In a very low inflation regime, inflation expectations do not matter for workers' nominal wage setting, and he obtains then the usual Phillips curve, as in the BSL variant. However, in a high(er) inflation regime, workers' inflation expectations matter, and Rowthorn then derive unanticipated inflation as a function of economic activity. The latter idea has been included into Hein (2023a: ch. 5), Hein/Stockhammer (2009, 2010, 2011) and Stockhammer (2008).

any point in time, (…) it is neither exogenous nor is it a strong attractor for actual unemployment', as pointed out by Stockhammer (2008: 500-501). The consistent claims equilibrium is endogenous to aggregate demand and to economic policies through various channels, endogenous aspirations, labour market persistence, capital stock, real interest rate, tax rate and real exchange rate and their effects on targets (Hein/Stockhammer 2010, Hein 2023a: ch. 5).

For the sake of comparing the two approaches and generating some variants, we assume a one good closed economy, in which, however, the firms are different and may operate with different technologies and labour productivities. This heterogeneity provides the grounds for nominal wage setting having an impact on income shares, as explained by Sylos-Labini (1979). With nominal wages rising, only firms with the highest productivity (growth) can fully pass wage increases to prices, while firms with lower productivity (growth) have to reduce the mark-up to remain price-competitive – the average industry mark-up thus falls. With nominal wages falling, the firms with lowest productivity (growth) have to fully pass this on to prices, while firms with higher productivity growth do not have to – the average industry mark-up rises.

For all the model variants to be outlined below, we have workers' bargaining power and their target wage share (Ω_W^T) depending on the structure of the labour market and the social benefit system (union density, wage bargaining coverage, wage bargaining co-ordination, employment protection legislation, minimum wages, unemployment benefits) and positively affected by the level of economic activity and hence the employment rate (e):[6]

$$(1) \qquad \Omega_W^T = 1 - h_W^T = \Omega_0 + \Omega_1 e, \qquad 1 > \Omega_0 > 0,\ \Omega_1 \geq 0\ ,$$

with Ω_0 and Ω_1 representing the structural features of the labour market, the wage bargaining and the social benefits system.

The firms' target profit share (h_F^T) and thus their target wage share (Ω_F^T) is given by the constant mark-up in pricing, and thus, in a simple one good economy, by the structure of the goods market (degree of price competition) and the structural bargaining power of the trade unions, as well as by overhead costs.

$$(2) \qquad \Omega_F^T = 1 - h_F^T = 1 - h_0, \quad 1 > h_0 > 0\ .$$

For the wage and the price setting equations in each of the model variants, we assume that workers' current period nominal wage setting is affected by past period price inflation, indicating 'adaptive expectations' in the HS approach or 'indexing' in the BSL variant. Firms'

[6] While Lavoie (1992: ch. 7, 2022: ch. 8) refrains from relating workers' target real wage rate or wage share to the employment rate and rather prefers the growth rate of the employment rate as a determinant, Blecker/Setterfield (2019: ch. 5.2.3) have the workers' targets affected by the level of economic activity. For the sake of comparability with the alternative approach, we follow their model in the short-run reformulation by Hein (2023a: ch. 5.2.1).

price setting, however, will be affected by current period nominal wage inflation. It is thus assumed that workers set nominal wages at the beginning of the period, partly based on past period inflation, while firms then set prices partly based on current period wage inflation. This is different from what is assumed in Serrano et al. (2023) in their assessment of the BSL and HS approaches, where it is assumed that both workers and firms simultaneously set wages and prices based on price and wage inflation expected or indexed, and then the frequency of wage and price setting is viewed as an indicator of bargaining power.[7]

We also assume that there is neither coordination of wage bargaining among trade unions or employers nor coordination between wage setters and price setters in order to internalise macroeconomic externalities of wage and price setting. As shown in Hein/Stockhammer (2009, 2010, 2011) and Hein (2023a: ch. 6), for example, such wage bargaining coordination as part of post-Keynesian incomes policy could align workers' wage share targets with those of firms, make Phillips curves horizontal in some relevant range and prevent inflation rates from varying with employment rates.

Furthermore, we will assume for all the model variants that a wage-led demand regime, as usually found in empirical research for domestic demand,[8] and, with constant labour productivity, therefore a wage-led employment regime prevails. Furthermore, in a monetary production economy with creditor-debtor relationships between rentiers and firms, real debt effects of unexpected inflation on aggregate demand and employment have to be taken into account. The effects will be expansionary if the 'normal case' conditions (Lavoie 1995) of real interest rate effects on aggregate demand and a 'debt burdened regime' prevail (Hein 2014: ch. 9), which we assume here. We can thus apply the following employment curve, with unexpected inflation being a determinant only in those model variants, which generate persistent unexpected inflation:

$$(3) \qquad e = e\left(\Omega, \hat{p}^u\right), \quad \frac{\partial e}{\partial \Omega} > 0, \frac{\partial e}{\partial \hat{p}^u} > 0 \,.$$

Based on these common elements, we can now distinguish the prototype BSL and HS models as we find them in the respective literature, as well as the respective modifications, according to the wage- and price-inflation equations applied, the inflation (Phillips) and distribution curves generated and the type of the derived (dis-)equilibria. We will apply the same stepwise procedure for each model variant in this and the following sections. We will start with wage- and price-inflation equations, derive the deviation of current period's wage and price inflation from past period's inflation, check whether these discrepancies will disappear and stable

[7] See also Tarling/Wilkinson (1985) for relating bargaining power to the frequency of nominal wage and price setting.

[8] For empirical multi-country results on the distribution-led nature of demand and growth, making use of the structural or single equation estimation approach and finding wage-led demand results for domestic demand throughout, i.e. excluding the effect of distributional changes on net exports, see Hartwig (2014), Onaran/Galanis (2014) and Onaran/Obst (2016).

wage- and price-inflation curves emerge, discuss the changes in distribution and the feedbacks on the employment curve, and finally check whether stable equilibrium positions emerge.

3. The two prototype textbook models

3.1 The prototype BSL model: BSL-0

Following Blecker/Setterfield (2019: ch. 5.2.3) and Lavoie (1992: ch. 7, 2022: ch. 8), workers' current period's nominal wage inflation ($\hat{w}_t$) is determined by the deviation of past periods' wage share (Ω_{t-1}) from their target wage share and by past period inflation ($\hat{p}_{t-1}$), which is assumed to be incompletely 'indexed' (Lavoie 2022: 601):

$$\begin{aligned}\hat{w}_t &= \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}, \qquad \varphi_1 > 0, 1 > \varphi_2 \geq 0 \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}\end{aligned} \tag{4}$$

Short-run excess wage inflation ($\hat{w}_t^x$), the deviation of current wage inflation from past period's price inflation, is given as

$$\begin{aligned}w_t^x = \hat{w}_t - \hat{p}_{t-1} &= \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) - \left(1-\varphi_2\right)\hat{p}_{t-1} \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) - \left(1-\varphi_2\right)\hat{p}_{t-1}\end{aligned} \tag{5}$$

Firms' price inflation is determined by the deviation of their target wage share from past period's wage share and by current wage inflation, which is assumed to be incompletely passed through to current price inflation:

$$\begin{aligned}\hat{p}_t &= \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\hat{w}_t, \qquad \pi_1 > 0, 1 > \pi_2 \geq 0 \\ &= \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\left[\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}\right] \\ &= \pi_1\left(\Omega_{t-1} - 1 + h_0\right) + \pi_2\left[\varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}\right]\end{aligned} \tag{6}$$

The short-run change in inflation, which in an adaptive expectation framework can be called unexpected inflation ($\hat{p}_t^u$), is given as:

$$\begin{aligned}\hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} &= \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) - \left(1-\pi_2\varphi_2\right)\hat{p}_{t-1} \\ &= \pi_1\left(\Omega_{t-1} - 1 + h_0\right) + \pi_2\varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) - \left(1-\pi_2\varphi_2\right)\hat{p}_{t-1}\end{aligned} \tag{7}$$

Since $\pi_2, \varphi_2 < 1$, short-run changes in inflation rates will disappear ($\hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} = 0$) after several periods, and from equations (4) and (6) we obtain for equilibrium price and wage inflation and the equilibrium wage share:

$$(8) \qquad \hat{p}^{*} = \hat{w}^{*} = \frac{\varphi_1 \pi_1 \left(\Omega_0 + \Omega_1 e + h_0 - 1\right)}{\varphi_1 \left(1-\pi_2\right) + \pi_1 \left(1-\varphi_2\right)},$$

$$(9) \qquad \Omega^{*} = \frac{\frac{\varphi_1}{1-\varphi_2}\left(\Omega_0 + \Omega_1 e\right) + \frac{\pi_1}{1-\pi_2}\left(1-h_0\right)}{\frac{\varphi_1}{1-\varphi_2} + \frac{\pi_1}{1-\pi_2}}.$$

The assumptions of incomplete or no 'indexation' and hence of constant or sticky inflation expectations of workers in the wage-inflation equation together with incomplete pass-through of wage inflation to price inflation thus generates a stable Phillips curve in equation (8) with $\frac{\partial \hat{p}^{*}}{\partial e} > 0$ and a stable profit-squeeze distribution curve in equation (9) with $\frac{\partial \Omega^{*}}{\partial e} > 0$.

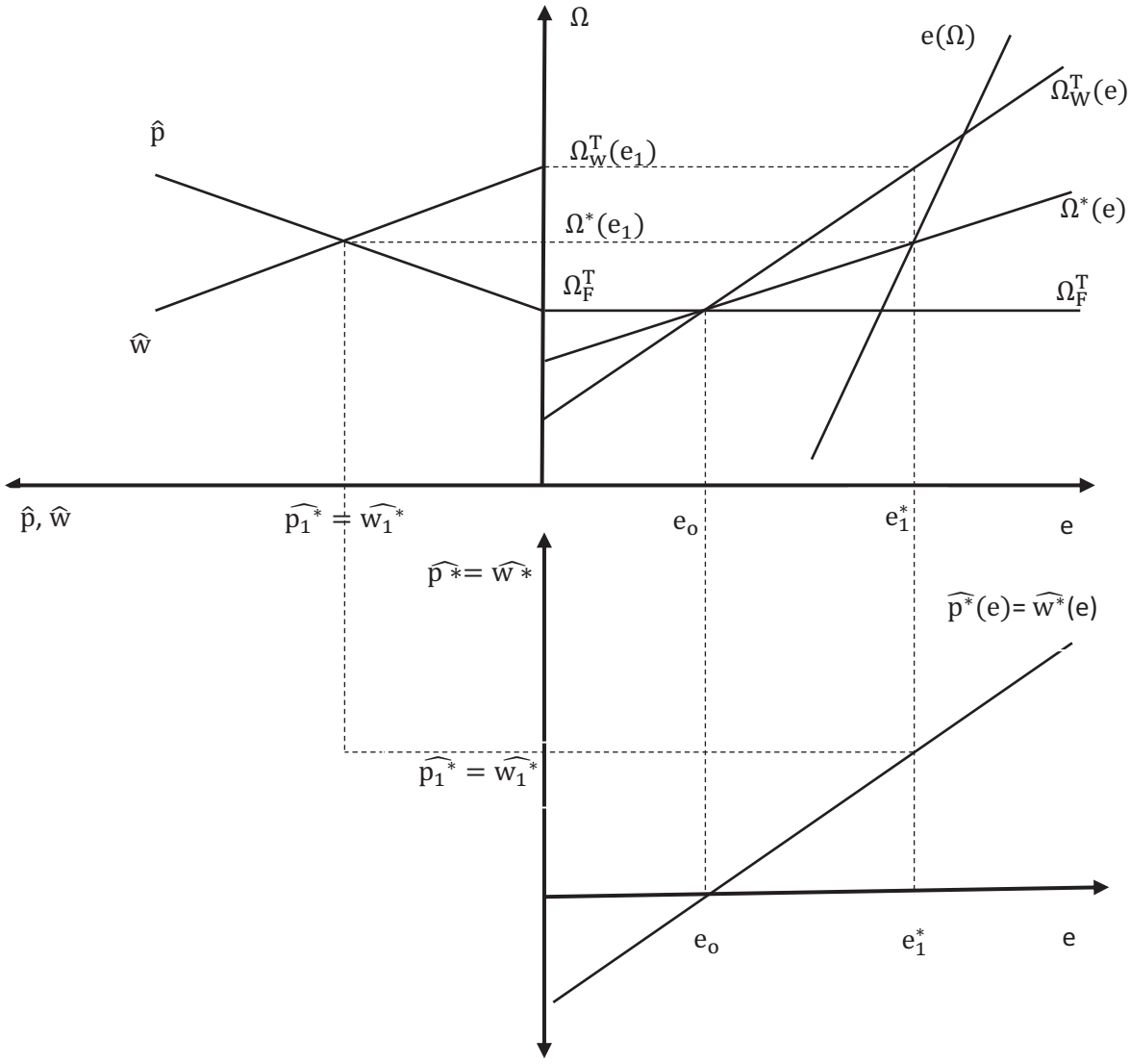
As argued by Hein (2023a: ch. 5), it remains somewhat unclear why in the BSL-0 model workers should be powerful and aim at a higher wage share ($\Omega_W^T - \Omega_{t-1} > 0$) and hence raise wage inflation (equation 4) without fully taking into account expected price inflation, which, in a basic approach, could be assumed to follow adaptive expectations ($\hat{p}_t^e = \hat{p}_{t-1}$). Therefore, it remains unclear why $\varphi_2 < 1$. It implies that workers' power allows them to aim at a higher real wage rate and higher wage share, but workers systematically underestimate future inflation and have some kind of money illusion. A similar argument holds for the firm sector and the price-inflation equation (5). Why should firms not fully incorporate current period wage inflation into price inflation if they are sufficiently powerful to aim at a higher profit share and hence a lower wage share ($\Omega_{t-1} - \Omega_F^T > 0$) by means of raising price inflation? What exactly does a higher target profit share and a lower target wage share of firms mean if they cannot even fully pass-through current wage inflation, which, of course, may be the case, as we have pointed out above? In our view, the BSL approach suffers from a lack of a clear distinction between power and expectations components in the wage- and price-inflation equations.

Lavoie (2022: 601) has argued that the inclusion of the last period´s inflation into the wage inflation function should not be interpreted as workers' price inflation expectations. He argues that instead of anticipating future inflation, workers only demand a compensation for previous inflation. However, this effect is already taken into account in the aspiration gap, which increases with past period inflation. Hence, in the BSL-0 model the price indexation parameter in the wage inflation function should be interpreted as workers' inflation expectations. In case these are considered to be irrelevant, the indexation parameter in the BSL-0 approach should simply be left aside, because the aspiration gap sufficiently captures the workers' power and desire to receive a compensation for past period´s inflation.

The full BSL-0 model is displayed in Figure 1. In the upper left quadrant, we have the wage- and price-inflation equations (4) and (6). In the upper right quadrant, the target wage shares of workers and firms from equations (1) and (2) are shown, as well as the profit-squeeze distribution curve from equation (9) and the wage-led employment curve from equation (3).

For the latter, we ignore the effects of short-run changes in inflation (equation 7) and the related real debt effects on aggregate demand and employment, which would shift this curve to the right, because these changes in inflation finally disappear. The lower right quadrant shows the equilibrium Phillips curve from equation (8). As shown by Blecker/Setterfield (2019: ch. 5.3), the stability of the model equilibrium requires the employment curve in the upper right quadrant to be steeper than the distribution curve. Such an equilibrium, given by the intersection of the wage-led employment curve and the profit-squeeze distribution curve, is shown in $e_1^*, \Omega^*(e_1), \widehat{p_1}^* = \widehat{w_1}^*$.

Figure 1: The prototype BSL model: BSL-0



A structural improvement of workers' bargaining power, i.e. a rise in Ω_0 or Ω_1 in equation (1), will lead to an upwards shift/rotation of the workers' target wage share curve, the profit-squeeze distribution curve (9), the wage-inflation curve (4) and the Phillips curve (8). As a result, we will get higher equilibrium wage and price inflation, a higher equilibrium wage share and a higher equilibrium employment rate.

A higher target profit share of firms will shift their target wage share curve (2), the profit-squeeze distribution curve (9), and the price-inflation curve (6) down each, and the Phillips curve (8) will shift up. We will get a lower equilibrium wage share and a lower employment rate, and depending on the slope of the employment curve, we may get higher or lower inflation in the new equilibrium.[9]

3.2 The prototype HS model: HS-0

Hein/Stockhammer (2009, 2011) have formulated an alternative to the BSL approach in a growth model framework and Hein (2023a: ch. 5.2.2) in a short-run level framework. Here we follow the latter. From the workers' and firms' target wage shares in equations (1) and (2), a consistent claims rate of employment, the SIRE (e^N), is derived:

$$(10) \qquad e^N = \frac{1 - h_0 - \Omega_0}{\Omega_1}$$

With $e > e^N$, we have a positive aspiration gap, i.e. the workers' target wage share exceeds the firms' target, and workers try to improve the wage share, for given labour productivity, by raising nominal wage inflation above expected price inflation. For the latter, adaptive expectations are assumed, i.e. $\hat{p}_t^e = \hat{p}_{t-1}$. With $e < e^N$, we have a negative aspiration gap, i.e. the workers' target wage share falls short of the firms' target, and workers are too weak to keep wage inflation in line with expected price inflation. We thus get:

$$(11) \qquad \hat{w}_t = \omega\left(e_t - e^N\right) + \hat{p}_{t-1}, \qquad \omega > 0 .$$

For the excess of wage inflation over expected price inflation we have:

$$(12) \qquad \hat{w}_t^x = \hat{w}_t - \hat{p}_t^e = \hat{w}_t - \hat{p}_{t-1} = \omega\left(e_t - e^N\right).$$

Firms have a constant target wage share from equation (2), but for the reasons put forward by Sylos Labini (1979), firms' price inflation in the aggregate can only partially pass through wage inflation. Here, it is assumed that this incomplete pass-through is related to the excess of wage (dis-)inflation given by the (un-)favourable employment rate relative to the SIRE. It is thus assumed that firms raise prices according to expected inflation given by past price inflation and incompletely pass through excess wage (dis-)inflation:

$$(13) \qquad \hat{p}_t = \vartheta\omega\left(e_t - e^N\right) + \hat{p}_{t-1}, \qquad 1 > \vartheta \geq 0 .$$

[9] A very flat wage-led employment curve, i.e. a strong effect of the decline in the wage share on the employment rate, may over-compensate the upwards shift in the Phillips curve, such that we get a decline in equilibrium inflation in this case.

Unexpected inflation in each period is thus given by:

$$(14) \qquad \hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} = \vartheta\omega\left(e_t - e^N\right).$$

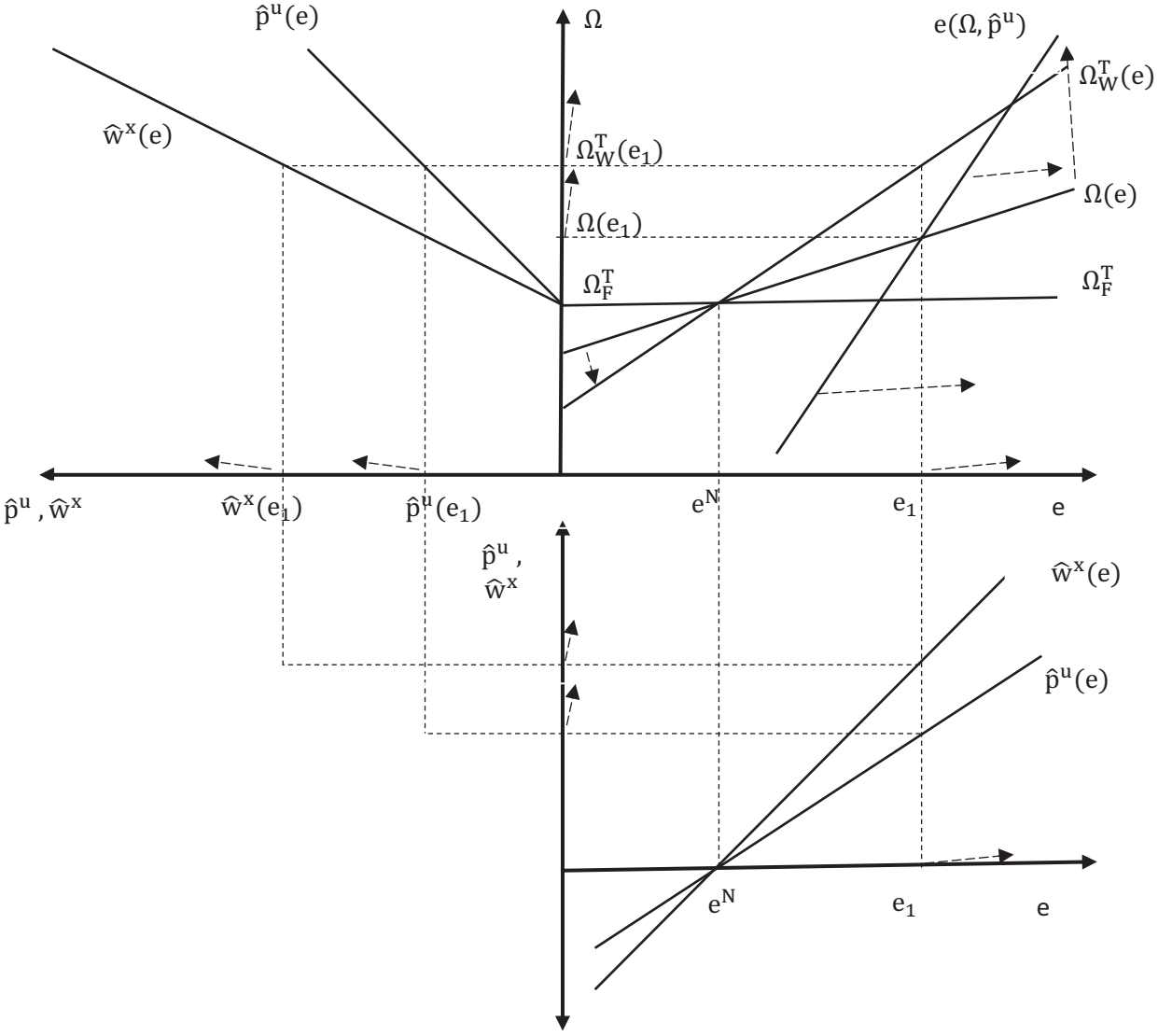
Excess wage inflation from equation (12) exceeds unexpected inflation in equation (14). Because of rising wage inflation with rising employment rates and incomplete pass-through to price inflation, we also obtain a profit-squeeze distribution curve:

$$(15) \qquad \Omega = \Omega(e), \qquad \frac{\partial\Omega}{\partial e} > 0.$$

In the HS-0 model, target wage shares are not directly included in the wage- and price-inflation equations (11) and (13). These equations are rather affected by the employment rate relative to the SIRE ($e_t - e^N$). For given structural determinants of workers' and firms' target wage shares determining the SIRE in equation (10), changes in the employment rate affecting workers' power directly impact wage and price inflation. Changes in the structural features, impacting the respective wage share targets, affect wage and price inflation through the effect on the SIRE. For example, a falling degree of competition in the goods market raises firms' target mark-up, lowers the SIRE, and, for a given employment rate, price and wage inflation increase, albeit not in step because of incomplete pass-through.

The full HS-0 model is shown in Figure 2. In the upper right quadrant, we have the workers' and the firms' target wages shares from equations (1) and (2), the profit-squeeze distribution curve from equation (15) and the wage-led employment curve from equation (3). The upper left quadrant and the lower right quadrant show the unexpected inflation curve from equation (14) and excess wage inflation from equation (12). The model does not generate a stable Phillips curve. Only at the SIRE (e^N) will wage and price inflation be equal and constant, and unexpected price inflation and excess wage inflation will be zero, generating constant functional distribution, too. Any employment rate $e \neq e^N$ will be associated with unexpected price (dis-)inflation and higher excess wage (dis-)inflation, and hence with rising or falling wage shares. This makes the profit-squeeze distribution curve rotate towards the workers' target wage share curve. The intersection of profit-squeeze distribution and wage-led employment curve in e_1 thus does not generate a stable equilibrium, because the distribution curve will rotate counter-clockwise, since excess wage inflation will exceed unexpected price inflation, and the employment curve will shift to the right because of real debt effects of unexpected inflation on aggregate demand. The employment rate will rise beyond e_1 in this process, without reaching an equilibrium. It will thus move ever farther away from e^N. The SIRE/NAIRU is thus 'not a strong attractor' (Sawyer 2002), and any deviation will lead to a cumulatively unstable process, with rising (falling) employment rates, rising (falling) unexpected inflation and rising (falling) excess wage inflation, the latter exceeding the former, and hence rising (falling) wage shares, even exceeding (falling below) the workers' target wage share.

Figure 2: The prototype HS model: HS-0



The results regarding accelerating wage and price inflation are thus similar to the Carlin/Soskice (2009, 2015) three equation model, as a version of new consensus macroeconomics (NCM). Carlin/Soskice, however, assume full pass-through of wage inflation to price inflation, hence $\vartheta = 1$, which means that the distribution curve is always equal to the firms' target wage share curve in their model. Furthermore, they do not consider any direct feedback effects of accelerating inflation on demand-determined employment via changes in distribution or real debt. In their model, the employment rate is then affected by interest rate variations introduced by inflation-targeting monetary policies, or also by real exchange rate variations induced by international inflation differentials in the open economy.

A structural improvement of workers' bargaining power in the HS-0 model, i.e. a rise in Ω_0 or Ω_1 in equation (1), will lead to an upwards shift/rotation of the workers' target wage share curve (1) and of the profit-squeeze distribution curve (15). The wage-led employment

curve (3) will shift to the right because of higher unexpected inflation. In the lower right quadrant, the unexpected inflation curve (14) and the excess wage-inflation curve (12) will shift up. As a result, we will get a lower SIRE, but a higher employment rate, higher unexpected inflation, higher excess wage inflation and a higher wage share in the new temporary position, with further upwards shifts, as indicated above.

A higher target profit share of firms will shift their target wage share curve (2) and the profit-squeeze distribution curve (15) down. The wage-led employment curve (3) will shift to the right because of higher unexpected inflation. In the lower right quadrant, the unexpected inflation curve (14) and the excess wage-inflation curve (12) will shift up. As a result, we will get a lower SIRE. The temporary effects on the other variables are undetermined. With a weak real debt effect on the shift of the employment curve, the employment rate will fall, and with a flat employment curve, also unexpected inflation and excess wage inflation may go down in the new temporary position. However, then the rotation of the distribution curve and the shift of the employment curve will raise the employment rate and drive up unexpected inflation and excess wage inflation again and thus shift the employment rate farther away from the new SIRE in a cumulative process.

4. Modifying the BSL-0 model

If in the BSL model either wage inflation is fully indexed with respect to past price inflation ($\varphi_2 = 1$), indicating workers having adaptive expectations, or current price inflation fully passes through current wage inflation ($\pi_2 = 1$), equilibrium distribution as a function of the employment rate in equation (9) is no longer defined. If both wage inflation is fully indexed and price inflation fully passes through wage inflation, also equilibrium inflation as a function of the employment rate in equation (8) is not defined any more. Let us now examine three cases: First, we can assume that only wage inflation is fully indexed, but pass-through of wage inflation to price inflation is incomplete. Second, we will assume the reverse, i.e. partial indexation of wage inflation and full pass-through to price inflation, and, third, we can have full indexation of wage inflation and full pass-through to price inflation.

4.1 The BSL model with full indexation/adaptive expectations in the wage-inflation equation and partial pass-through in the price-inflation equation: BSL-1

With full indexation of wage inflation, or adaptive expectations of workers and trade unions while attempting to move the wage share up to their target, the wage-inflation equation in the BSL model, taking into account workers' target wage share equation (1), turns to:

$$\begin{aligned}\hat{w}_t &= \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}, \quad \varphi_1 > 0, \varphi_2 = 1 \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \hat{p}_{t-1}\end{aligned} \tag{16}$$

Excess wage inflation in the short run is thus given as:

$$\hat{w}_t^x = \hat{w}_t - \hat{p}_{t-1} = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) = \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right). \tag{17}$$

For price inflation we assume a partial pass-through of contemporary wage inflation as in equation (6), which we reproduce here:

$$\begin{aligned}\hat{p}_t &= \pi_1\left(\Omega_{t-1}-\Omega_F^T\right)+\pi_2\hat{w}_t, \qquad \pi_1>0, 1>\pi_2\geq 0\\ &= \pi_1\left(\Omega_{t-1}-1+h_0\right)+\pi_2\hat{w}_t\end{aligned} \tag{6}$$

Including wage inflation (16) into price inflation (6) yields for unexpected inflation in the short run:

$$\begin{aligned}\hat{p}_t^u = \hat{p}_t-\hat{p}_{t-1} &= \pi_1\left(\Omega_{t-1}-\Omega_F^T\right)+\pi_2\varphi_1\left(\Omega_W^T-\Omega_{t-1}\right)-\left(1-\pi_2\right)\hat{p}_{t-1}\\ &= \pi_1\left(\Omega_{t-1}-1+h_0\right)+\pi_2\varphi_1\left(\Omega_0+\Omega_1 e-\Omega_{t-1}\right)-\left(1-\pi_2\right)\hat{p}_{t-1}.\end{aligned} \tag{18}$$

Since $\pi_2<1$, over several periods unexpected inflation will converge to zero, the economy will converge towards $\hat{p}_t=\hat{p}_{t-1}$, and we get:

$$\begin{aligned}\hat{p}_t &= \frac{\pi_1\left(\Omega_{t-1}-\Omega_F^T\right)+\pi_2\varphi_1\left(\Omega_W^T-\Omega_{t-1}\right)}{1-\pi_2}\\ &= \frac{\pi_1\left(\Omega_{t-1}-1+h_0\right)+\pi_2\varphi_1\left(\Omega_0+\Omega_1 e-\Omega_{t-1}\right)}{1-\pi_2}\end{aligned} \tag{19}$$

For wage inflation this implies:

$$\begin{aligned}\hat{w}_t &= \frac{\pi_1\left(\Omega_{t-1}-\Omega_F^T\right)+\left[\varphi_1\left(1-\pi_2\right)+\pi_2\varphi_1\right]\left(\Omega_W^T-\Omega_{t-1}\right)}{1-\pi_2}\\ &= \frac{\pi_1\left(\Omega_{t-1}-1+h_0\right)+\left[\varphi_1\left(1-\pi_2\right)+\pi_2\varphi_1\right]\left(\Omega_0+\Omega_1 e-\Omega_{t-1}\right)}{1-\pi_2}\end{aligned} \tag{20}$$

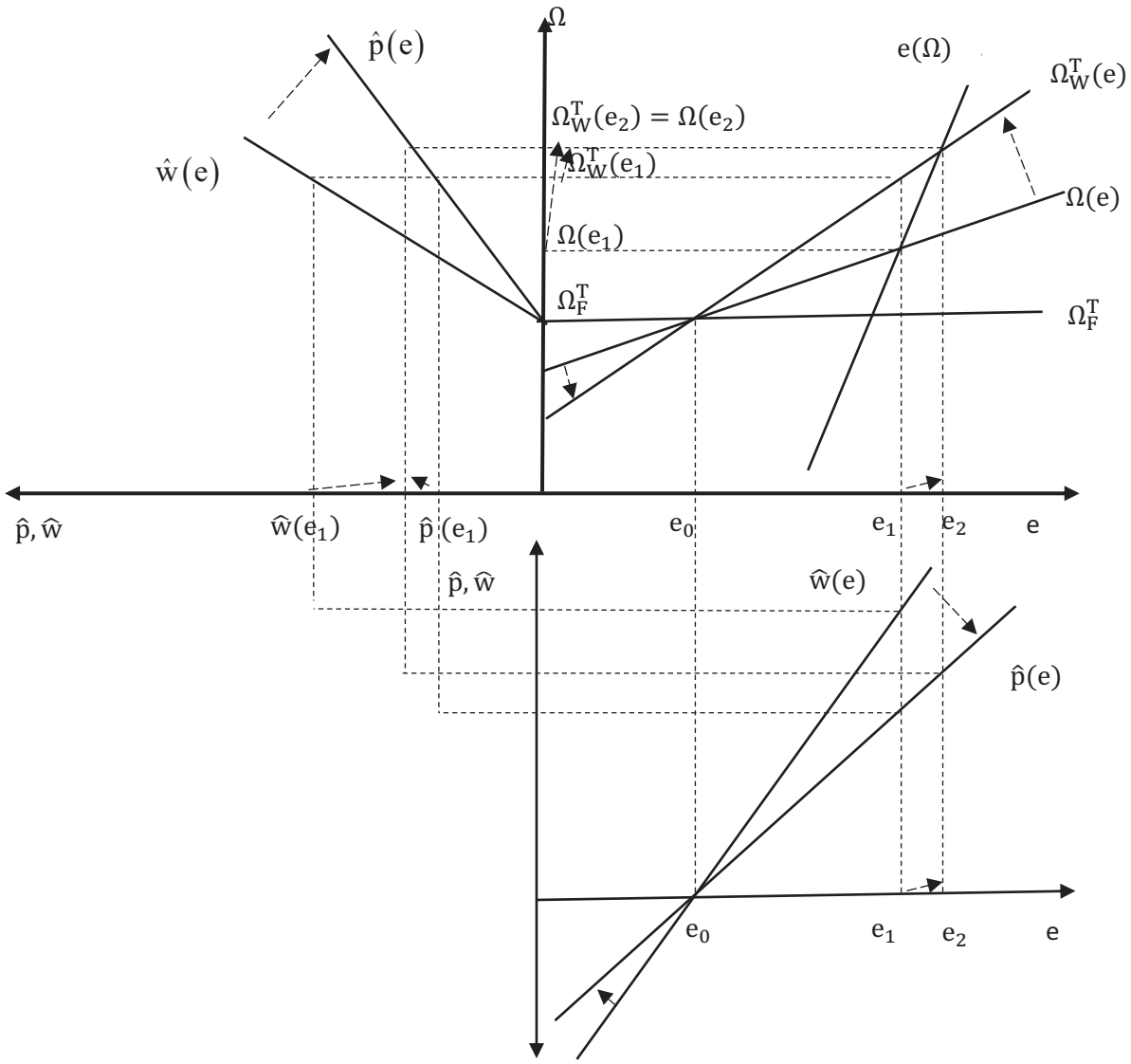
Wage inflation will thus exceed price inflation. This is why the profit-squeeze distribution curve will rotate towards the workers' target wage share curve. As soon as this is reached, wage inflation will be equal to price inflation, and the latter will be driven by the deviation of the firms' target wage share from the actual wage share, which is equal to the workers' target wage share, as can be derived from equations (19) and (20), or also from equation (8):

$$\hat{p}_t^* = \hat{w}_t^* = \frac{\pi_1\left(\Omega_W^T-\Omega_F^T\right)}{1-\pi_2} = \frac{\pi_1\left(\Omega_0+\Omega_1 e-1+h_0\right)}{1-\pi_2}, \tag{21}$$

with:

(22) $\Omega^{*} = \Omega_{W}^{T} = \Omega_{0} + \Omega_{1} e$.

Figure 3: The BSL model with full indexation of wage inflation and incomplete pass-through to price inflation: BSL-1



The effects of full indexation of wage inflation to past price inflation, hence adaptive expectations, and an incomplete pass-through to price inflation in the BSL-1 model are shown in Figure 3. The upper left and lower right quadrants show the price and wage-inflation equations (19) and (20), with the former rotating towards the latter. In the upper right quadrant, the rotation of the distribution curve towards the workers' target wage share means that the economy will not remain at the temporary position at e_1, but that it will move to a higher stable equilibrium employment rate at e_2 with the workers' target wage share reached, provided the slope or the employment curve exceeds the slope of the workers' target wage

share curve. In the final equilibrium, workers will reach their target wage share at a higher equilibrium employment rate, and inflation will only be driven by the firms' unsuccessful desire to lower the wage share towards their target wage share.

In this stylised presentation, we have ignored the effects of short-run unexpected inflation from equation (18) on the employment curve (3). Including these would also shift this curve to the right, but since unexpected inflation will peter out, we will still reach an equilibrium with a higher employment rate, a higher inflation rate and the wage share equal to the workers' target wage share.

The results regarding long-run distribution and inflation in the case of full indexation of past inflation in the wage-inflation equation and partial pass-through of wage inflation to price inflation are in line with Lavoie (2022: ch. 8). However, Lavoie neither has targets related to employment rates nor does he discuss the feedback effects on economic activity and the employment rate.

4.2 The BSL model with partial indexation in the wage-inflation equation and full pass-through to price inflation: BSL-2

In the alternative case of incomplete indexation of wage inflation to past inflation, but complete pass-through of current wage inflation to current price inflation, we receive the opposite results, as can be shown as follows. We keep wage-inflation equation (4):

$$\begin{aligned}\hat{w}_t &= \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}, \quad \varphi_1 > 0, 1 > \varphi_2 \geq 0 \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}\end{aligned} \tag{4}$$

Excess wage inflation is thus again given as:

$$\begin{aligned}w_t^x = \hat{w}_t - \hat{p}_{t-1} &= \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) - \left(1-\varphi_2\right)\hat{p}_{t-1} \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) - \left(1-\varphi_2\right)\hat{p}_{t-1}\end{aligned} \tag{5}$$

For price inflation we now assume a full pass-through of wage inflation:

$$\begin{aligned}\hat{p}_t &= \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\hat{w}_t, \qquad \pi_1 > 0, \pi_2 = 1 \\ &= \pi_1\left(\Omega_{t-1} - 1 + h_0\right) + \hat{w}_t\end{aligned} \tag{23}$$

Inserting wage inflation from equation (4) into the price equation (23) yields for unexpected inflation:

$$\begin{aligned}\hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} &= \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) - \left(1-\varphi_2\right)\hat{p}_{t-1} \\ &= \pi_1\left(\Omega_{t-1} - 1 + h_0\right) + \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) - \left(1-\varphi_2\right)\hat{p}_{t-1}\end{aligned} \tag{24}$$

Unexpected price inflation will thus exceed unexpected wage inflation. Since $\varphi_2 < 1$, over several periods unexpected inflation will converge to zero, the economy will converge towards $\hat{p}_t = \hat{p}_{t-1}$, and we get:

$$\begin{aligned}\hat{p}_t &= \frac{\pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right)}{1-\varphi_2} \\ &= \frac{\pi_1\left(\Omega_{t-1} - 1 + h_0\right) + \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right)}{1-\varphi_2}\end{aligned} \tag{25}$$

Wage inflation will hence converge to:

$$\begin{aligned}\hat{w}_t &= \frac{\varphi_2\pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right)}{1-\varphi_2} \\ &= \frac{\varphi_2\pi_1\left(\Omega_{t-1} - 1 + h_0\right) + \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right)}{1-\varphi_2}\end{aligned} \tag{26}$$

Wage inflation thus falls short of price inflation, and the distribution curve will rotate towards the firms' target wage share curve. Since this implies that firms will reach their target wage share, price inflation converges to wage inflation, and both are driven by the deviation of the actual wages, equal to the firms' target, from the workers' target wage share. From equations (25) and (26), as well as from equation (8), we get for the final equilibrium:

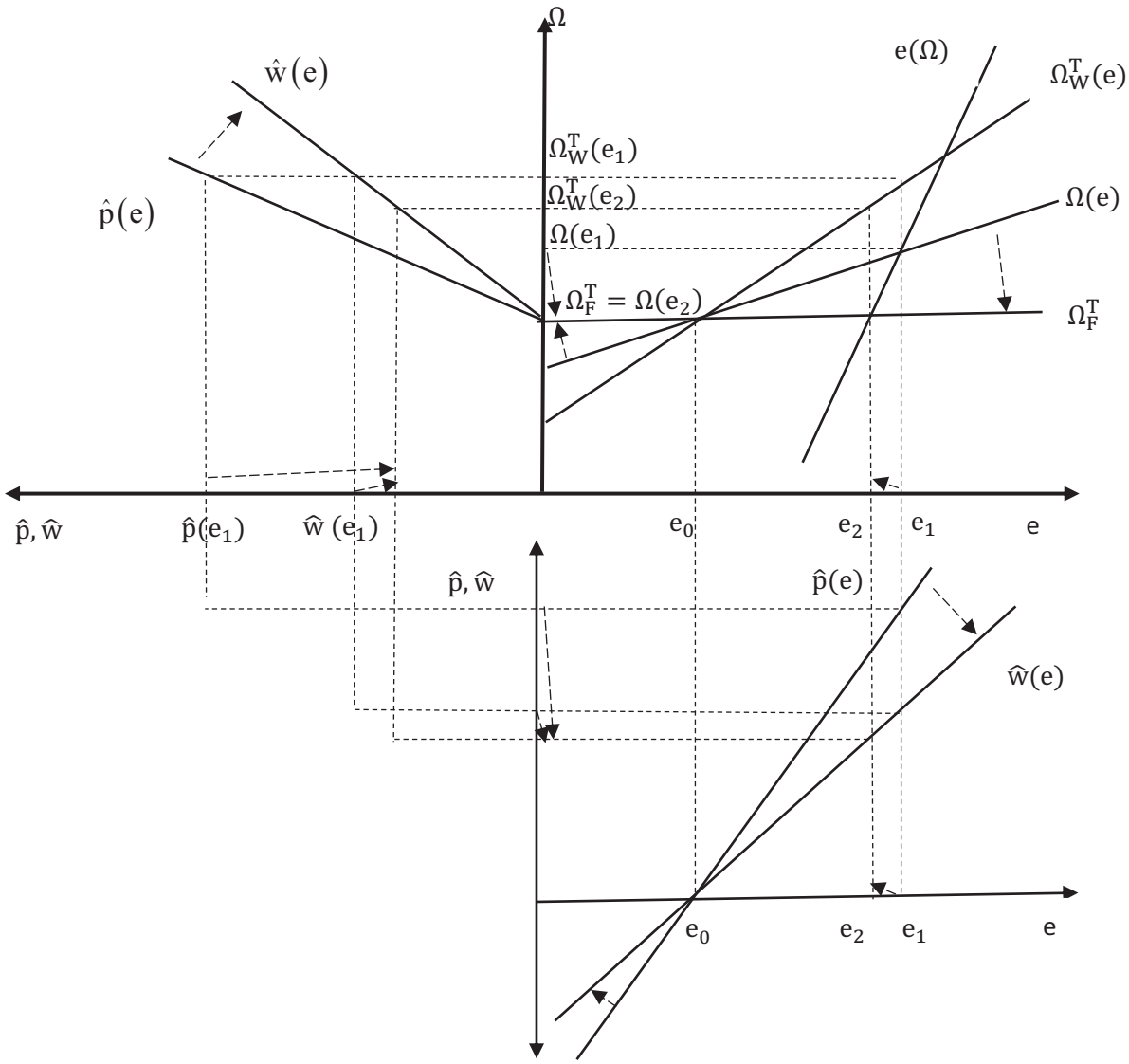
$$\hat{p}^* = \hat{w}^* = \frac{\varphi_1\left(\Omega_W^T - \Omega_F^T\right)}{1-\varphi_2} = \frac{\varphi_1\left(\Omega_0 + \Omega_1 e - 1 + h_0\right)}{1-\varphi_2}, \tag{27}$$

with

$$\Omega^* = \Omega_F^T = 1 - h_0 . \tag{28}$$

In Figure 4 these adjustments in the BSL-2 model are shown. The position at e_1 is not a stable equilibrium, since price inflation exceeds wage inflation because of incomplete indexation of the latter. The distribution curve rotates towards the firms' target wage share and the price-inflation curve adjusts to the wage-inflation curve. This leads to a new stable equilibrium at e_2 with a lower employment rate, a lower inflation rate, equal to and driven by wage inflation, and a lower wage share, equal to the firms' target.

Figure 4: The BSL model with incomplete indexation of wage inflation and full pass-through to price inflation: BSL-2



In this stylised presentation, we have again ignored the effects of short-run unexpected inflation from equation (24) on the employment curve (3). Including these would also shift this curve to the right, but since unexpected inflation will peter out, we will still reach an equilibrium. Depending on the relevance and the strength of the real debt effects on aggregate demand, this equilibrium could even mean a higher employment rate, a higher inflation rate as compared to the initial positon at e_1, with the wage share equal to the firms' target wage share.

Again, our results regarding long-run distribution and inflation in the case of incomplete indexation of past inflation in the wage-inflation equation and complete pass-through of wage inflation to price inflation are in line with Lavoie (2022: ch. 8), who, however, does not relate them to the employment rate, as pointed out above.

4.3 The BSL model with full indexation/adaptive expectations in wage inflation and complete pass-through to price inflation: BSL-3

In the final variant of the BSL model, BSL-3, we assume simultaneous full indexation/adaptive expectations in wage inflation and complete pass-through in price inflation, as in equations (16) and (23):

$$\begin{aligned}\hat{w}_t &= \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}, \quad \varphi_1 > 0, \varphi_2 = 1 \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \hat{p}_{t-1}\end{aligned} \tag{16}$$

$$\begin{aligned}\hat{p}_t &= \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\hat{w}_t, \qquad \pi_1 > 0, \pi_2 = 1 \\ &= \pi_1\left(\Omega_{t-1} - 1 + h_0\right) + \hat{w}_t\end{aligned} \tag{23}$$

Excess wage inflation is given by:

$$\begin{aligned}\hat{w}_t^x &= \hat{w}_t - \hat{p}_{t-1} = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right)\end{aligned} \tag{17}$$

Making use of equations (16) and (23), we receive for unexpected inflation:

$$\begin{aligned}\hat{p}_t^u &= \hat{p}_t - \hat{p}_{t-1} = \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) \\ &= \pi_1\left(\Omega_{t-1} - 1 + h_0\right) + \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right)\end{aligned} \tag{29}$$

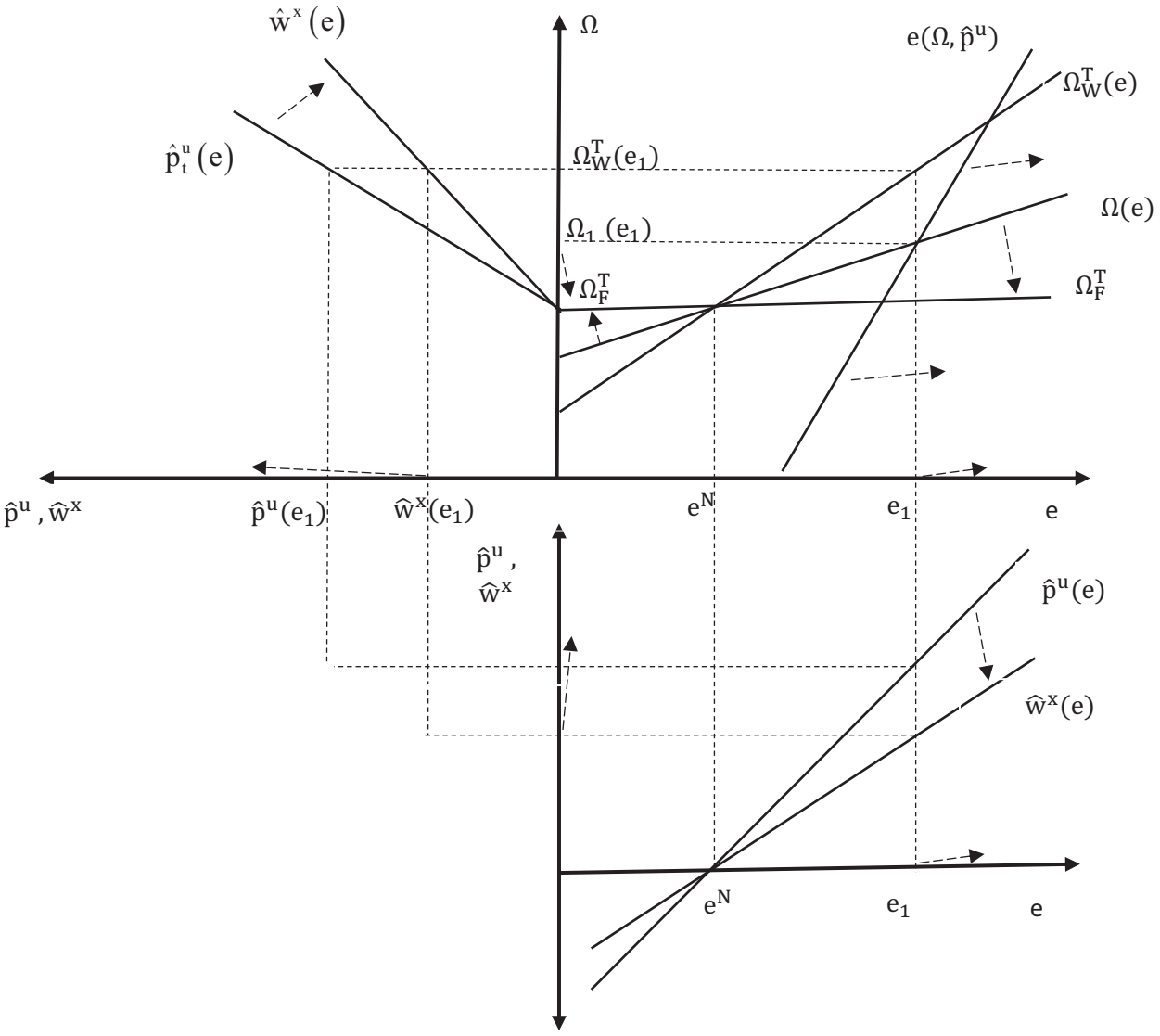
Only if firms' and workers' targets are consistent, will excess wage inflation and unexpected price inflation be zero and wage and price inflation will be equal and constant. The model thus generates a SIRE at:

$$e^N = \frac{1 - h_0 - \Omega_0}{\Omega_1}, \tag{10}$$

like the HS-0 model. However, different from that model, for $e \neq e^N$ in the BSL-3 model, unexpected inflation will exceed excess wage inflation, as can be seen in equations (17) and (29). Workers set nominal wages first and firms then set prices, completely passing through wage inflation and adding to it according to the deviation of the wage share from their target. The profit-squeeze distribution curve thus rotates towards the firms' target wage share and hence becomes horizontal. Since firms finally reach their distribution target, unexpected price inflation converges to excess wage inflation and is driven by the latter:

$$\hat{w}_t^x = \hat{w}_t - \hat{p}_{t-1} = \hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) = \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right). \tag{30}$$

Figure 5: The BSL model with full indexation of wage inflation and complete pass-through to price inflation: BSL-3



The results of the BSL-3 model are shown in Figure 5. The model does not generate a stable Phillips curve anymore, and we will have unexpected (dis-)inflation and excess wage (dis-)inflation for any deviation from the SIRE ($e \neq e^N$). Since unexpected (dis-)inflation exceeds excess wage (dis-)inflation, the distribution curve convergences towards the firms' target wage share curve, and the unexpected price-inflation curve converges towards the excess wage-inflation curve. The position at e_1 is thus highly unstable. For a given employment curve, the rotation of the distribution curve would move the employment rate towards the SIRE and would thus be stabilising around the latter. However, real debt effects (equation 3) of unexpected inflation shift the employment function to the right and destabilise employment around the SIRE. Starting with e_1, we will thus see rising employment rates together with

rising unexpected inflation being equal to excess wage inflation and hence a constant wage share equal to the firms' target.

The results regarding accelerating wage and price inflation, as well as firms always reaching their target, are thus similar to the Carlin/Soskice (2009, 2015) NCM model. As pointed out above, however, Carlin/Soskice do not consider any direct feedbacks of accelerating inflation on demand-determined employment.

5. Modifying the HS-0 model

From Sections 3 we have got that the HS-0 model differs from the BSL-0 model in two respects. First, target wage shares of firms and workers are not directly included into the wage- and price-inflation equations. Instead, these equations include, directly via the employment rate and indirectly via the SIRE, the relative powers of workers and firms. We will see in variants HS-2 and HS-3 what difference it makes to directly include the workers' target wage share relative to the actual wage share. Second, in the HS-0 model incomplete pass-through of wage inflation to price inflation has been assumed. More specifically, it was assumed that firms raise prices according to expected inflation given by past price inflation and only incompletely pass through excess wage (dis-)inflation. In the variant HS-1 and HS-2, we will see what differences arise, if we assume that incomplete pass-through is related to total wage inflation and not only to excess wage inflation.

5.1 The HS model with incomplete pass-through of total wage inflation: HS-1

For the HS-1 version, we keep the wage-inflation equation (12) and hence the excess wage-inflation equation (13) from the HS-0 model:

(12) $\hat{w}_t = \omega\left(e_t - e^N\right) + \hat{p}_{t-1}, \qquad \omega > 0,$

(13) $\hat{w}_t^x = \hat{w}_t - \hat{p}_t^e = \hat{w}_t - \hat{p}_{t-1} = \omega\left(e_t - e^N\right).$

However, instead of partial pass-through of excess wage inflation, we now assume partial pass-through of total wage inflation in the new price-inflation equation:

(31) $\hat{p}_t = \vartheta\left[\omega\left(e_t - e^N\right) + \hat{p}_{t-1}\right], \qquad 1 > \vartheta \geq 0.$

Unexpected inflation in the short run thus turns to:

(32) $\hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} = \vartheta\omega\left(e_t - e^N\right) - \left(1-\vartheta\right)\hat{p}_{t-1}.$

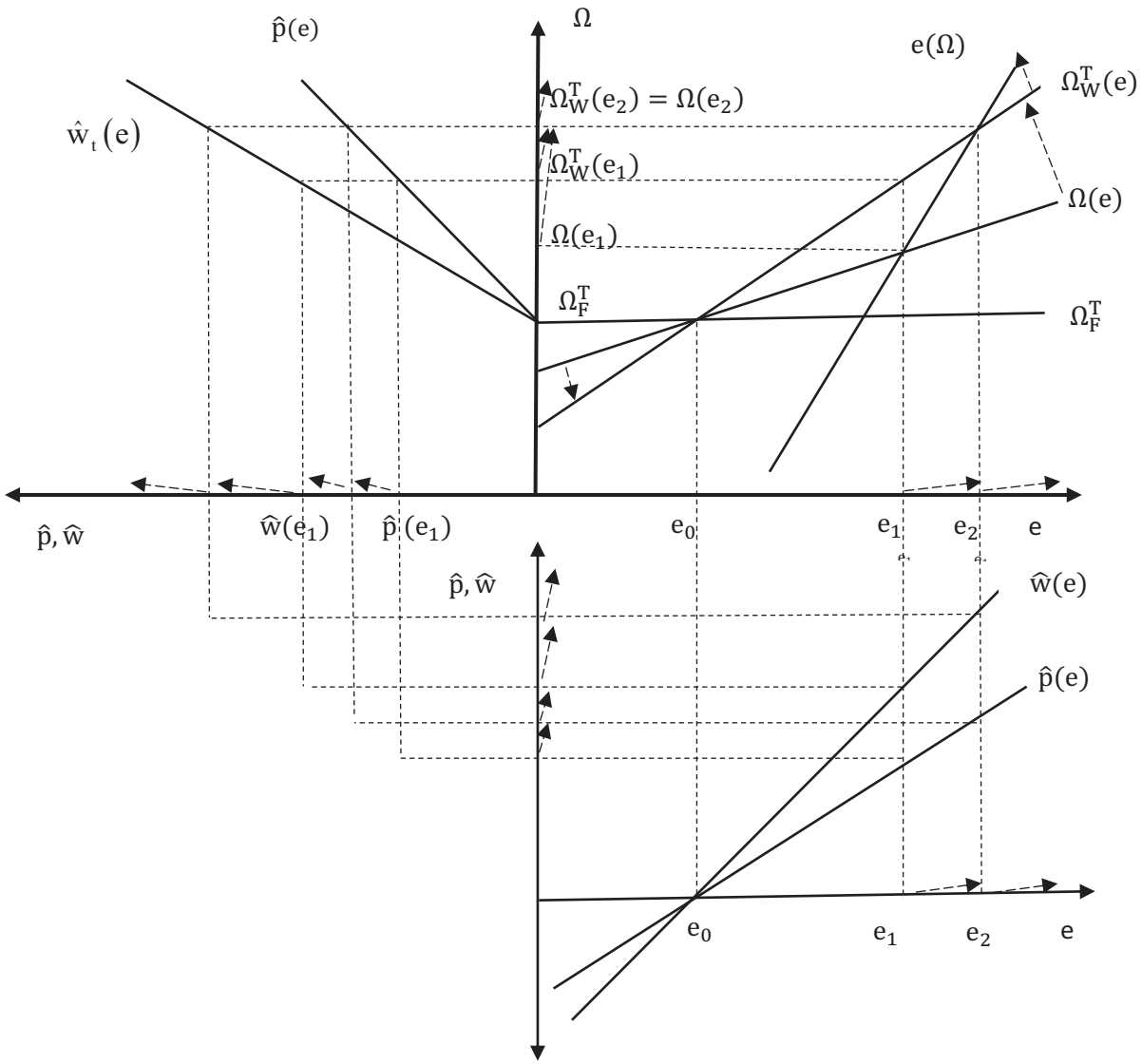
Since $\vartheta < 1$, over several periods unexpected inflation will vanish ($\hat{p}_t - \hat{p}_{t-1} = 0$), and we obtain for price and wage inflation:

(33) $$\hat{p}_t = \frac{\vartheta\omega\left(e_t - e^N\right)}{\left(1-\vartheta\right)},$$

(34) $$\hat{w}_t = \frac{\omega\left(e_t - e^N\right)}{\left(1-\vartheta\right)} = \frac{1}{\vartheta}\hat{p}_t .$$

The model thus generates a stable price Phillips curve. However, wage inflation will exceed price inflation at any employment rate. The profit-squeeze distribution curve is thus not stable, but will rotate towards the workers' target wage share curve and even beyond.

Figure 6: The HS model with incomplete pass-through of total wage inflation: HS-1



The HS-1 model is shown in Figure 6. In the upper left and lower right quadrants we have the wage- and price-inflation equations (33) and (34), with a zero inflation rate at e_0, as in the BSL model variants. However, at $e \neq e_0$, wage (dis-)inflation exceeds price (dis-)inflation. This rotates the distribution curve in the upper right quadrant towards the workers' target wage share. The position at employment rate e_1 will thus move to the higher employment rate e_2, at which workers have reached their target wage share. Since unexpected inflation will peter out in the long run in this model variant, again we ignore short-run real debt effects of unexpected inflation on the wage-led employment curve, which would shift this curve and the employment rate e_2 farther to the right. But at e_2, wage inflation still exceeds price inflation, and the distribution curve would rotate beyond the workers' target, moving the employment rate further above e_2 and destabilising the economy. We would thus see rising employment rates, rising wage shares and rising price inflation falling short of wage inflation, and hence a cumulatively unstable process along stable wage- and price-Phillips curves. However, the inconsistency driving this process, namely wage shares rising above workers' target, can be taken care of by directly including the workers' target wage share into the wage-inflation equation. This is what we do in the next variant.

5.2 The HS model with the target wage share in the wage inflation function and partial pass-through of total wage inflation: HS-2

In the HS-2 variant, we are using the wage-inflation equation (16) together with the excess wage-inflation equation (17) from the BSL-1 model, in which we have the deviation of last period's wage share from the workers' target and in in which we interpret full indexation as workers having adaptive expectations:

$$\begin{aligned} \hat{w}_t &= \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2 \hat{p}_{t-1}, \quad \varphi_1 > 0, \varphi_2 = 1 \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \hat{p}_{t-1} \end{aligned} \tag{16}$$

$$\hat{w}_t^x = \hat{w}_t - \hat{p}_{t-1} = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) = \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right). \tag{17}$$

For price inflation, we assume partial pass-through of total wage inflation here, as in the HS-1 variant:

$$\begin{aligned} \hat{p}_t &= \vartheta\left[\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2 \hat{p}_{t-1}\right], \qquad 1 > \vartheta \geq 0 \\ &= \vartheta\left[\varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \hat{p}_{t-1}\right] \end{aligned} \tag{35}$$

Unexpected inflation in the short run turns to:

(36) $$\hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} = \vartheta\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) - \left(1-\vartheta\right)\hat{p}_{t-1}$$
$$= \vartheta\varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) - \left(1-\vartheta\right)\hat{p}_{t-1}$$

Because of incomplete pass-through, unexpected price inflation in equation (36) will thus fall short of excess wage inflation in equation (16). Since $\vartheta < 1$, over several periods unexpected inflation will vanish ($\hat{p}_t - \hat{p}_{t-1} = 0$), and inflation turns constant, with wage inflation exceeding price inflation:

(37) $$\hat{p}_t = \frac{\vartheta\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right)}{1-\vartheta} = \frac{\vartheta\varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right)}{1-\vartheta},$$

(38) $$\hat{w}_t = \frac{\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right)}{1-\vartheta} = \frac{\varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right)}{1-\vartheta} = \frac{1}{\vartheta}\hat{p}_t.$$

With wage inflation exceeding price inflation, the wage share will rise towards workers' target, and wage and price inflation will converge towards zero, which means we have in the long run:

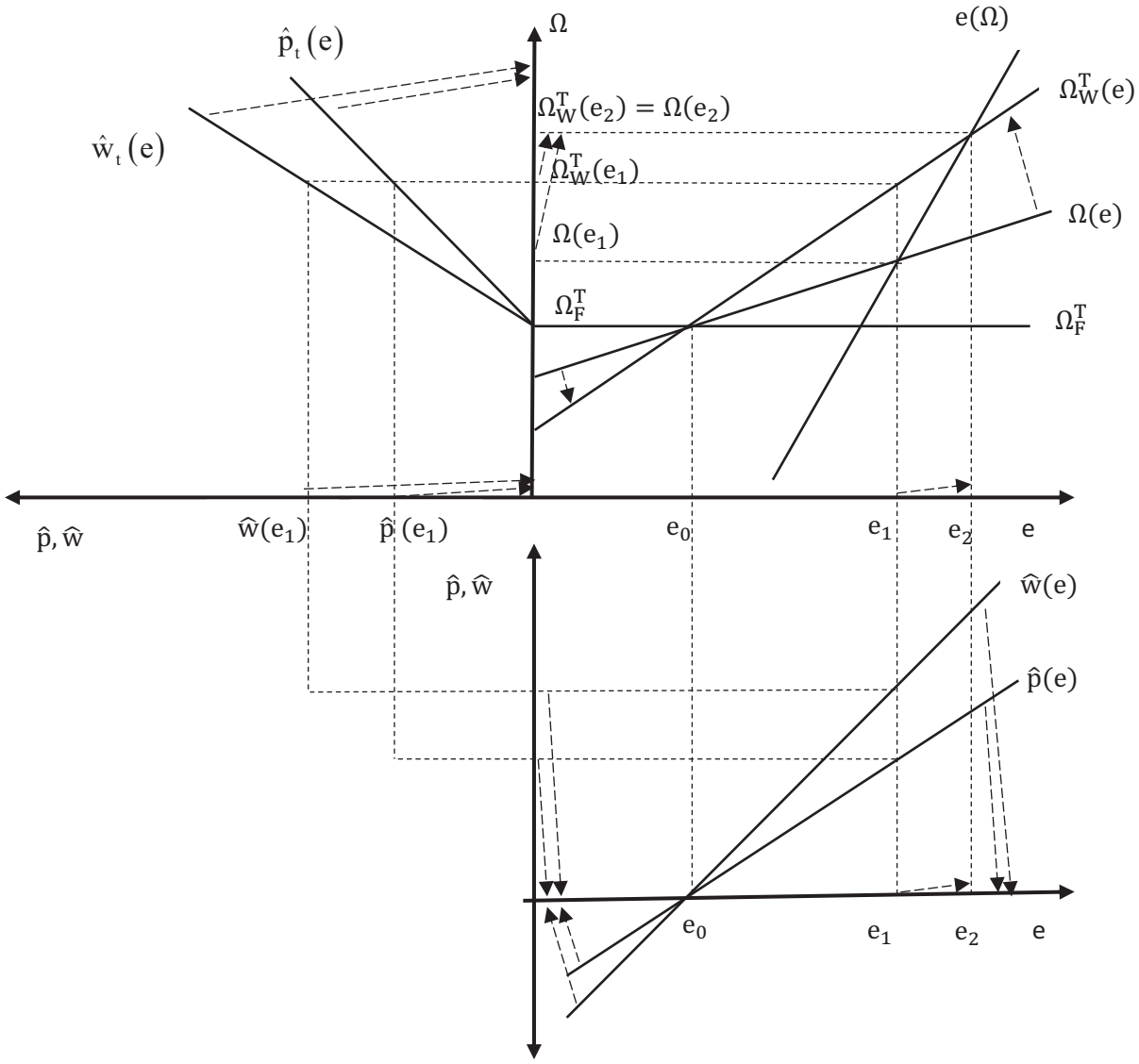
(39) $$\hat{p}_t^* = \hat{w}_t^* = 0,$$

with

(40) $$\Omega^* = \Omega_W^T = \Omega_0 + \Omega_1 e.$$

The HS-2 variant is shown in Figure 7. In the upper left and lower right quadrants we have the wage- and price-inflation curves from equations (37) and (38). Since wage (dis-)inflation exceeds price (dis-)inflation at any employment rate, the distribution curve in the upper right quadrant rotates towards the workers' target wage share curve. In the course of this process, wage- and price-inflation curves rotate to zero; we thus obtain a horizontal Phillips curve at zero inflation. Starting with the employment rate e_1, the economy will thus move to the employment rate e_2. Again, we ignore the rightward shifting effects of temporary unexpected inflation on the employment curve. At e_2, the model economy reaches a stable equilibrium with zero wage and price inflation, hence with constant prices, and the wage share equal to the workers' target wage share.

Figure 7: The HS model with the target wage share in the wage-inflation function and partial pass-through of total wage inflation: HS-2



5.3 The HS model with the target wage share in the wage inflation function and partial pass-through of excess wage inflation: HS-3

In the final model variant to be discussed, HS-3, we will explore whether it makes a difference to include the partial pass-through of excess instead of total wage inflation, as in the HS-0 model, in an HS model with the target wage share of workers in the wage-inflation equation. We start again with the wage inflation and the excess wage-inflation equations from the previous variant, the HS-2:

$$\begin{aligned} \hat{w}_t &= \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2 \hat{p}_{t-1}, \quad \varphi_1 > 0, \varphi_2 = 1 \\ &= \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \hat{p}_{t-1} \end{aligned} \tag{16}$$

(17) $$\hat{w}_t^x = \hat{w}_t - \hat{p}_{t-1} = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) = \varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right).$$

For price inflation, we assume partial pass-through of excess wage inflation only, like in the HS-0 model:

(41) $$\begin{aligned}\hat{p}_t &= \vartheta\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_1\hat{p}_{t-1}, \qquad 1 > \vartheta \geq 0\\ &= \vartheta\varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right) + \hat{p}_{t-1}\end{aligned}$$

Unexpected inflation is thus:

(42) $$\begin{aligned}\hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} &= \vartheta\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right)\\ &= \vartheta\varphi_1\left(\Omega_0 + \Omega_1 e - \Omega_{t-1}\right)\end{aligned}$$

Because of incomplete pass-through, price inflation falls short of wage inflation at any employment rate, and unexpected inflation is lower than excess wage inflation. This means that the profit-squeeze distribution curve rotates towards the workers' target wage share curve. Since the workers finally reach their target, excess wage inflation and unexpected price inflation will each converge towards zero, and wage and price inflation will converge to some definite but path-dependent rate.

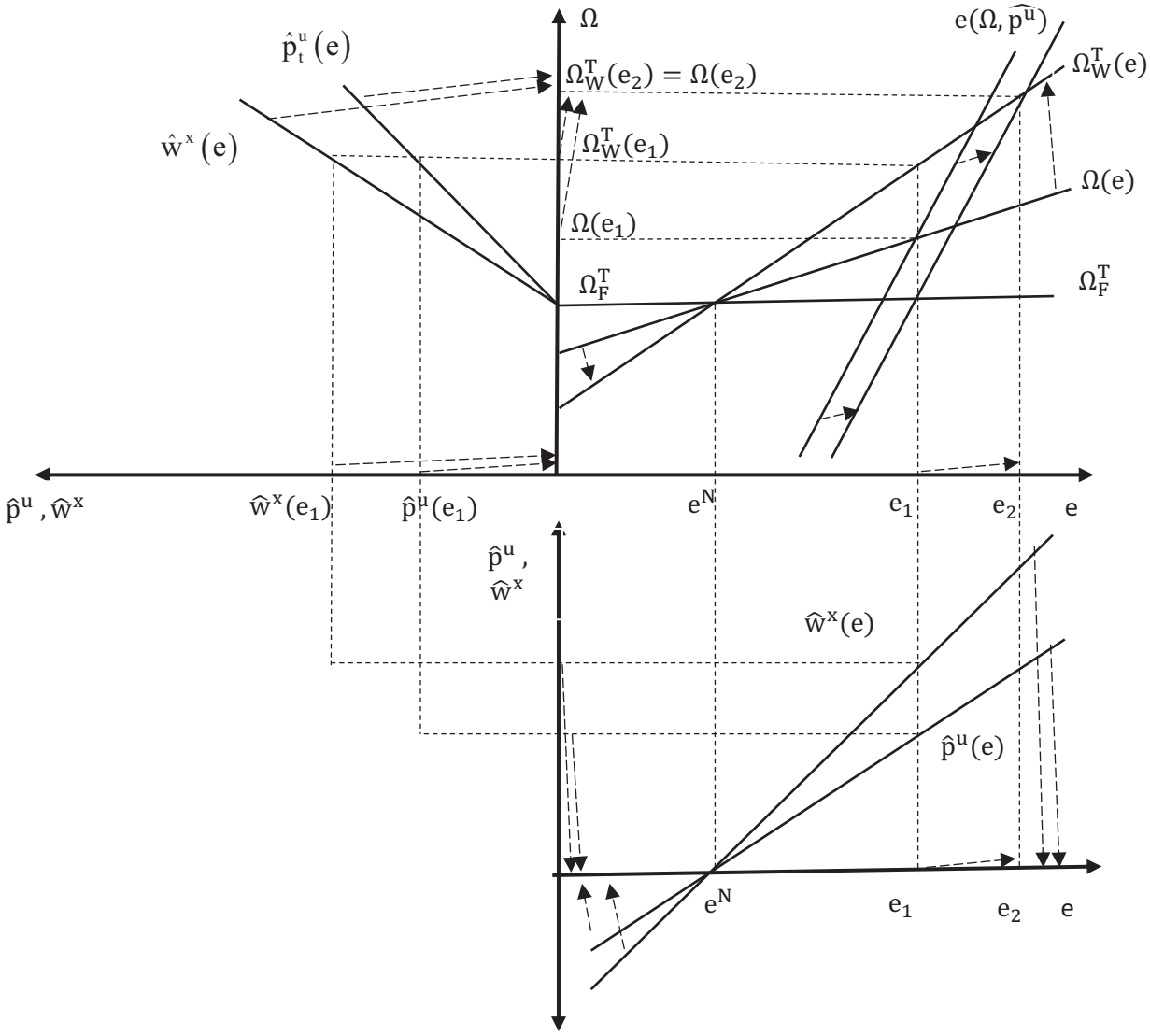
(43) $$\hat{w}_t^x = \hat{w}_t - \hat{p}_{t-1} = \hat{p}_t^u = \hat{p}_t - \hat{p}_{t-1} = 0$$

with

(44) $$\Omega^* = \Omega_W^T = \Omega_0 + \Omega_1 e.$$

The HS-3 model is shown in Figure 8. In the upper-left and lower-right quadrant we find the excess wage-inflation curve from equation (17) and the unexpected inflation curve from equation (42). Since wage inflation exceeds price inflation at employment rate e_1, the distribution curve will rotate towards the workers' target wage share curve in the upper-right quadrant, and excess wage and unexpected price inflation will converge towards zero. In this convergence process, the employment curve will shift to the right because of expansionary real debt effects on aggregate demand until the equilibrium is reached. When the distribution curve has turned equal to the workers' target wage share curve, excess wage and unexpected price inflation will turn to zero, and the model economy reaches an equilibrium at the employment rate e_2, with path-dependent constant inflation and the equilibrium wage share equal to the workers' target.

Figure 8: The HS model with the target wage share in the wage-inflation equation and partial pass-through of excess wage inflation: HS-3



6. Comparison and assessment

In Table 1, the main characteristics of our eight model variants are summarised, according to the respective wage- and price-inflation equations used, the emanating Phillips, distribution and employment curves and the implications for (dis-)equilibria. Most of the BSL model variants generate stable Phillips, distribution and employment curves which lead to stable equilibria. Depending on the assumptions regarding indexation of wage inflation and pass-through in price inflation, equilibrium distribution will settle between workers' and firms' target wages shares (BSL-0), or we will see 'corner solutions', with the equilibrium wage share equal to the workers' target (BSL-1) or the firms' target (BSL-2). Only the BSL-3 variant with complete indexation in wage inflation and complete pass-through to price inflation does not generate stable Phillips, distribution and employment curves, and hence no stable equilibrium. Here, only at the SIRE will inflation, distribution and employment be constant.

This variant is closest to the HS-0 model, which also has shifting Phillips, distribution and employment curves, and hence no stable equilibrium, whenever the employment deviates from the SIRE. The HS-1 model with incomplete pass-through of total wage inflation, instead of only excess wage inflation as in HS-0, also does not generate a stable equilibrium, although it has a stable upwards sloping Phillips curve, like the BSL-0, BSL-1 and BSL-2 models. Here, the instability is generated by omitting the workers' target wage share from the wage-inflation equation, such that workers keep on raising nominal wage inflation above expected price inflation, although targets have been reached, because they have the power to do so. Remedying this problem in the HS-2 and HS-3 models, generates stable and flat Phillips curves, either at zero or at path-dependent constant inflation, and thus stable equilibria. Different from the BSL-0, BSL-2 and BSL-3 models, the HS models each have a tendency of distribution moving towards and finally achieving the workers' target wage share (or even to go beyond this in HS-0 and HS-1), because each of the models assume incomplete pass-through of (excess) wage inflation.

This comparison is meant to clearly spell out the differences and implications of each of the basic post-Keynesian/Kaleckian textbook conflict inflation models and their variations in a transparent way. In this context, we have already pointed out some of the problems of each of the approaches. In the BSL approach in general, it remains unclear why workers, who feel strong enough to target a higher wage share by means of raising nominal wage inflation, do not fully take into account expected price inflation – in a simple model indicated in an adaptive way by past period's inflation. Similarly, it remains unclear why firms, if they feel sufficiently powerful to raise the profit share and thus lower their target wage share, do not fully take into account current wage inflation while setting prices. In other words, in these models the relationship between targets and power to push for achieving the targets remains vague and does not seem to be fully consistent. In the HS approaches, in particular the HS-0 and HS-1 variants, power relationships, indicated by the deviation of the employment rate from the SIRE, are directly introduced into the wage- and price-inflation equations, generally assuming incomplete pass-through of wage (dis-)inflation to price (dis-)inflation. However, the omission of targets from the wage-inflation equation leads to implausible results, if the long-run implications are considered: Powerful workers may increase wage inflation above expected price inflation although they have already reached their targets. Directly including workers' targets into the wage-inflation equation and linking that with incomplete pass-through in price inflation may generate more plausible results, generating a tendency towards flat Phillips curves and wage shares tending towards workers' targets, with the latter directly related to workers' bargaining power.

Table 1: BSL and HS model variants compared						
	Wage inflation	**Price inflation**	**Phillips curve**	**Distribution curve**	**Employment curve**	**Equilibrium?**
BSL-0	incomplete indexation $\hat{w}_t = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1},$ $\varphi_1 > 0, 1 > \varphi_2 \geq 0$	incomplete pass-through $\hat{p}_t = \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\hat{w}_t,$ $\pi_1 > 0, 1 > \pi_2 \geq 0$	upwards sloping in e, stable	profit-squeeze, stable $\Omega_W^T(e) > \Omega(e) > \Omega_F^T$	wage-led, stable	constant $e \neq e_0$, $\hat{p}^* = \hat{w}^*$, $\Omega_W^T > \Omega^* > \Omega_F^T$
BSL-1	complete indexation $\hat{w}_t = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1},$ $\varphi_1 > 0, \varphi_2 = 1$	incomplete pass-through $\hat{p}_t = \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\hat{w}_t,$ $\pi_1 > 0, 1 > \pi_2 \geq 0$	upwards sloping in e, stable	profit-squeeze, rotating towards $\Omega_W^T(e) = \Omega(e)$	wage-led, stable	constant $e \neq e_0$, $\hat{p}_t^* = \hat{w}_t^*$, $\Omega_W^T = \Omega^*$
BSL-2	incomplete indexation $\hat{w}_t = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1},$ $\varphi_1 > 0, 1 > \varphi_2 \geq 0$	complete pass-through $\hat{p}_t = \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\hat{w}_t,$ $\pi_1 > 0, \pi_2 = 1$	upwards sloping in e. stable	profit-squeeze, rotating towards $\Omega_F^T(e) = \Omega(e)$	wage-led, stable	constant $e \neq e_0$, $\hat{p}_t^* = \hat{w}_t^*$, $\Omega^* = \Omega_F^T$
BSL-3	complete indexation $\hat{w}_t = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1},$ $\varphi_1 > 0, \varphi_2 = 1$	complete pass-through $\hat{p}_t = \pi_1\left(\Omega_{t-1} - \Omega_F^T\right) + \pi_2\hat{w}_t,$ $\pi_1 > 0, \pi_2 = 1$	upwards sloping in e, shifting for any $e \neq e^N$	profit-squeeze, rotating towards $\Omega_F^T(e) = \Omega(e)$	wage-led, shifting	rising/falling $e \neq e^N$, rising/falling $\hat{w}, \hat{p}$, $\Omega^* = \Omega_F^T$

Table 1 continued: BSL and HS model variants compared						
	Wage inflation	**Price inflation**	**Phillips curve**	**Distribution curve**	**Employment curve**	**Equilibrium?**
HS-0	adaptive expectations, no explicit workers' target $\hat{w}_t = \omega\left(e_t - e^N\right) + \hat{p}_{t-1}$, $\omega > 0$	incomplete pass-through of excess wage inflation $\hat{p}_t = \vartheta\omega\left(e_t - e^N\right) + \hat{p}_{t-1}$, $1 > \vartheta \geq 0$	upwards sloping in e, shifting for any $e \neq e^N$	profit-squeeze, rotating towards $\Omega_W^T(e) = \Omega(e)$ and beyond	wage-led, shifting	rising/falling $e \neq e^N$, rising/falling $\hat{w}, \hat{p}$, rising/falling Ω
HS-1	adaptive expectations, no explicit workers' target $\hat{w}_t = \omega\left(e_t - e^N\right) + \hat{p}_{t-1}$, $\omega > 0$	incomplete pass-through of total wage inflation $\hat{p}_t = \vartheta\left[\omega\left(e_t - e^N\right) + \hat{p}_{t-1}\right]$, $1 > \vartheta \geq 0$	upwards sloping in e, stable	profit-squeeze, rotating towards $\Omega_W^T(e) = \Omega(e)$ and beyond	wage-led, shifting	rising/falling $e \neq e_0$, rising/falling $\hat{w}, \hat{p}$, rising/falling Ω
HS-2	adaptive expectations, explicit workers' target $\hat{w}_t = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}$, $\varphi_1 > 0, \varphi_2 = 1$	incomplete pass-through of total wage inflation $\hat{p}_t = \vartheta\left[\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}\right]$, $1 > \vartheta \geq 0$	horizontal in e at $\hat{p} = 0$, stable	profit-squeeze, rotating towards $\Omega_W^T(e) = \Omega(e)$	wage-led, stable	constant $e \neq e_0$, $\hat{p}_t^* = \hat{w}_t^* = 0$, $\Omega^* = \Omega_W^T$
HS-3	adaptive expectations, explicit workers' target $\hat{w}_t = \varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_2\hat{p}_{t-1}$, $\varphi_1 > 0, \varphi_2 = 1$	incomplete pass-through of excess wage inflation $\hat{p}_t = \vartheta\varphi_1\left(\Omega_W^T - \Omega_{t-1}\right) + \varphi_1\hat{p}_{t-1}$, $1 > \vartheta \geq 0$	horizontal in e at path-dependent $\hat{p}$, stable	profit-squeeze, rotating towards $\Omega_W^T(e) = \Omega(e)$	wage-led, stable	constant $e \neq e_0$, $\hat{p}_t^* = \hat{w}_t^*$, $\Omega^* = \Omega_W^T$

But we refrain from drawing too broad conclusions from the exercises presented in this paper, in particular regarding real-world relevance or applicability. As pointed out, the model versions are simple textbook models for closed economies without a government, operating with constant technology. The latter has allowed us to identify the demand regime with the employment regime. However, allowing for technical change and productivity growth may question whether a wage-led demand regime also generates a wage-led employment regime (Storm/Naastepad 2013). And including the external sector may question whether the demand regime is always wage-led, as assumed here (Onaran/Galanis 2014, Onaran/Obst 2016). Including the possibility of profit-led demand and employment regimes would thus generate further model variants. We have also assumed that the demand regime is always debt-burdened, or that normal case conditions for changes in real interest payments of the firm sector hold. Also this may be questioned, and allowing for puzzling case conditions and debt-led demand regimes would provide further variations (Hein 2023c).

Furthermore, in the model versions we have assumed that there is no macroeconomic wage bargaining coordination taking inflation externalities of nominal wage setting into account, neither on the workers'/trade unions' side, nor on the firms'/employer associations' side, nor between trade unions and employer associations. As proposed in post-Keynesian macroeconomic policy models (Hein 2023a: ch. 6, Hein/Stockhammer 2010), wage bargaining coordination could align wage share targets of workers and firms and flatten the wage- and price-Phillips curves, at least in certain ranges. We have also not systematically discussed for each of the model versions the effects of changes in the structural and institutional conditions for nominal wage setting in the labour market and price setting in the goods market. Also this could provide further variations.

7. Conclusions

In the Kaleckian tradition of post-Keynesian conflict inflation and distribution theory, we have two competing variants, also represented in the recent textbooks, the Blecker/Setterfield (2019) and Lavoie (1992, 2022) (BSL) model based on Dutt (1987), and the Hein (2023a) and Hein/Stockhammer (2011) (HS) model founded on Rowthorn (1977). In this paper, we have provided a systematic comparison of these approaches in a basic closed economy framework without a government, and we have presented several variations of each approach. We have shown that the differences between these approaches and the different variations mainly relate to the role of price inflation expectations (or 'indexation') and to the way workers' and firms' bargaining power is included into the wage- and price-inflation equations of the models. We have shown that the BSL approach and its different variants mainly generate stable price-Phillips curves, stable distribution and employment curves, and hence stable equilibria, however, with potentially different distribution outcomes depending on the assumptions regarding indexation in wage inflation and pass-through in price inflation. The only exception is the BSL-3 variant with complete indexation in the wage-inflation equation and complete pass-through in the price-inflation equation, which then generates shifting Phillips and employment curves, and hence unstable processes. The BSL-3 variant is closest to the prototype HS-0 approach, with bargaining power and complete indexation representing

adaptive expectation in wage inflation and incomplete pass-through in price inflation. This model also generates shifting Phillips and employment curves, rotating distribution curves and hence unstable process. However, we have shown that introducing workers' wage share targets directly into the wage-inflation equation, but keeping full indexation/adaptive expectations in wage inflation and incomplete pass-through in price inflation, allows for stable and even flat Phillips curves, stable distribution and employment curves, and hence stable equilibria in the HS approach.

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