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Conflict inflation without (explicit) unemployment

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Abstract

Since its introduction by Rowthorn (1977), the idea that inflation is always and everywhere a result of conflicting distributional claims has become widely accepted by post-Keynesians. This paper contributes to the literature with a proposed behavioural rule that abstracts from both unemployment and labour participation. While they are both presumed to be causally relevant, the causal chains are captured through a rule in which inflation is driven by the deviation between the growth rate of labour demand and that of the working age population. The proposed behavioural rule can be incorporated into a variety of models. One is proposed for concreteness. In the example model, profit-led behaviour produces a stable equilibrium. In the more empirically supported case of wage-led behaviour, stability is not guaranteed, but becomes more likely under cost share-induced technological change.

Keywords: conflict inflation, post-Keynesian, participation rate, cost share-induced technological change
JEL: E31, E12, E11

1 Introduction

This work is motivated by three practical challenges encountered when constructing post-Keynesian – and specifically neo-Kaleckian – growth models. The first is to account for both short-term adjustments in unemployment and long-run adjustments in participation rate. The second is to ensure that long-run growth – which is demand-led in post-Keynesian models – is compatible with supply constraints as expressed by Harrod's natural rate. And the third, highly pragmatic, challenge is to minimise the number of variables. The third challenge, while it may seem a minor concern, is required in theoretical models for analytical tractability and in empirical models to allow calibration with limited data. The solution adopted in this paper is to avoid the explicit appearance of either the unemployment or participation rate while accounting for them implicitly.

The neo-Kaleckian literature commonly assumes conflict-driven inflation, with a few variants in circulation (Hein and Häusler, 2024). This strand of research builds upon the original contribution of Rowthorn (1977) in a paper that spurred considerable later development (Rowthorn, 2024). Storm and Naastepad (2012) combined elements of conflict-based wage determination, Kaleckian output dynamics, and Kaldorian productivity dynamics in a growth model with an explicit unemployment variable; following Layard et al. (2005), they also included variables characterizing the structure and regulatory environment of the labour market. Starting from a Marxian perspective, Boddy (2009) constructed a simple (but empirically supported) econometric model of the wage share with the level of unemployment and changes in unemployment and capacity utilization as explanatory variables.

In conflict inflation models, firms and workers have conflicting goals for income distribution (Barbieri Góes et al., 2024). Adjustment takes place through wage bargaining and pricing, but it may also occur through changes in labour productivity. This is particularly true of Marxian-inspired models in which "[t]he distribution of income between the classes is viewed...as being determined by the interplay of technological progress on the one hand, and intra- and inter-class competition and conflict on the other" (Bhaduri, 2006). Post-Keynesian models often feature endogenous technological change through the Kaldor-Verdoorn mechanism (Kaldor, 1966), while classical/Marxian models of cost share-induced technological change include both labour and capital productivity (Duménil and Lévy, 2010; Dutt, 2013; Kemp-Benedict, 2022, 2024).

Both Bhaduri (2006) and Dutt (2006) introduce models in which labour productivity growth is an increasing function of the gap between employment growth and the growth in labour supply. This paper uses essentially the same casual factor - the gap between employment growth and the growth in the working-age population – but with the wage, rather than labour productivity growth, as the dependent variable. In the behavioural rule proposed in this paper, the nominal wage tracks labour productivity growth adjusted by expected inflation, rising above (or falling below) that tendency when growth in labour demand exceeds (or falls below) the growth rate of the working-age population. In contrast to Blecker and Setterfield (2019, chap. 5), who assume partial adjustment to productivity growth, the model in this paper assumes that in the long run changes in productivity fully pass through into changes in wages. The motivation is the efficiency wage hypothesis: firms compete with one another to recruit, retain, and motivate workers (Layard et al., 2005, chap. 3) and rising productivity gives them the means to do so. This presumes a ratchet effect through inter-firm competition, consistent with Rowthorn (2024, p. 1309), who noted that conflict inflation theories assume that macroeconomic outcomes arise from the uncoordinated actions of diverse agents operating on staggered schedules.

The behavioural rule proposed in this paper can be combined with a variety of additional rules to form closed models. For concreteness, a specific closed model is analysed in this paper, followed by a discussion of possible extensions and variations. The exemplary model features an equilibrium at which the growth rate of the economy is equal to Harrod's natural rate, achieving one of the paper's goals. Equilibrium capacity utilisation and distribution are determined simultaneously by the goods market equilibrium and the condition that growth is compatible with the available labour. Firms compete for finance, which leads them to target markups higher than those implied by the equilibrium functional income distribution; the average firm pursues above-average profitability, thereby generating inflation. A comparative statics exercise shows that rising interest rates depress both economic activity and wages. Stability analysis reveals an important role for the classical/Marxian cost share-induced technological change mechanism: in the model, a profit-led economy is guaranteed to be stable even in the absence of cost share-induced technological change, but that is not (necessarily) true for a wage-led economy.

Section 2 presents the conceptual framework motivating the behavioural rule that is the main contribution of this paper. Section 3 embeds the behavioural equation into a three-variable model. Section 4 explores the implications of the exemplary model. Section 5 summarises the results and considers possible extensions to the exemplary model. Section 6 concludes.

2 Conceptual framework

The central contribution of this paper is a behavioural rule. It applies to an economy in which the working-age population sets an upper bound but a substantial number of people of working age do not participate in the formal workforce. The conceptual model is illustrated in Fig. 1. As indicated in the figure, participation is well below 100%, so the workforce is less than the working age population, while the number of people employed is less than the workforce. In an expansion, employment begins to grow but labour participation does not immediately respond. Instead, as indicated in Fig. 1, the unemployment rate first begins to fall, but then rises again as people enter employment to take advantage of perceived opportunity and – under typical circumstances – higher wages. Gradually, unemployment returns to a stable level, but at a higher participation rate.

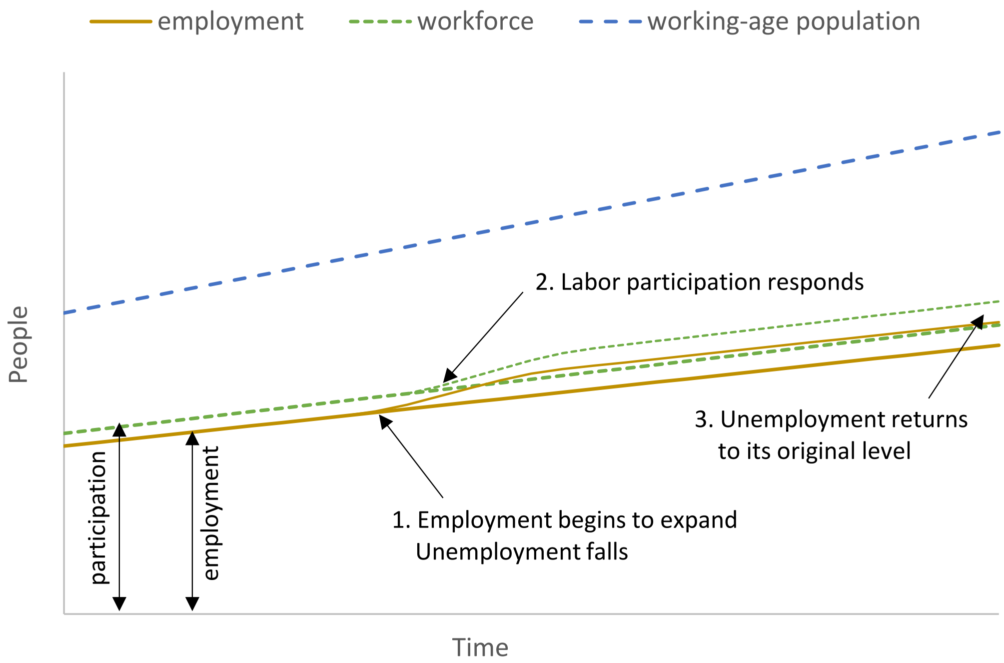

Figure 1: Conceptual model

The processes illustrated in Fig. 1 can in principle be modelled by tracking the unemployment and participation rates explicitly. However, we abstract from those processes to argue that wage pressure arises when employment L grows faster than the growth rate n of the working-age population. Otherwise, the nominal wage w tends to track (real) labour productivity λ plus expected inflation $\hat{p}^e$. Admittedly, this simplification loses some of the details in Fig. 1, in that low unemployment can persist after employment stabilises as new labour market participants continue to enter the workforce. However, this is a transient phenomenon that does not drive any dynamics; omitting it does not substantively alter the resulting trajectory. Using a 'hat' to indicate a growth rate, the proposed behavioural rule is

$$\hat{w} = \hat{\lambda}^s + \hat{p}^e + f(\hat{L} - n; \boldsymbol{x}, t), \quad f(0; \boldsymbol{x}, t) = 0, f' > 0. \tag{1}$$

The condition $f' > 0$ means that the derivative with respect to the first argument is always positive. In this equation, $\hat{\lambda}^s$ is a 'smoothed' rate of labour productivity growth that takes account of the lags involved in the inter-firm competition behind the efficiency wage. The vector $\boldsymbol{x}$ is a collection of possible covariates, such as the absolute gap $N - L$ between employment and the size of the working-age population, capacity utilisation, or institutional variables as in Layard et al. (2005) or Storm and Naastepad (2012).

In a one-good model, the wage share ω is equal to $\omega = w/\lambda p$. Substituting into Eq. (1), this gives an equation of motion for the wage share[1]

$$\hat{\omega} = \hat{\lambda}^s - \hat{\lambda} + \hat{p}^e - \hat{p} + f(\hat{L} - n; \boldsymbol{x}, t). \tag{3}$$

[1] In a model with multiple goods, this equation need not hold. For example, suppose that there is an 'essential' sector

Unlike in standard Kaleckian conflict inflation models (Hein and Häusler, 2024), workers have no target wage share. Instead, through this behavioural rule workers aim to at least maintain their status, opportunistically seek to improve it in a tight labour market, and make concessions in a weak labour market. The exemplary model presented in the next section has an equilibrium wage share that emerges from characteristics of the prevailing technology as well as the behaviours of both workers and firms. Inflation arises from firms targeting above-equilibrium profits.

The employment growth rate $\hat{L}$ in Eq. (3) can be derived by combining the identity $L = Y/\lambda$, where Y is output and λ is labour productivity, with the identity $Y = u\kappa K$, where u is capacity utilisation, κ is capital productivity, and K is a behaviourally consistent measure of the capital stock.[2] The result is:

$$L = \frac{Y}{\lambda} = \frac{u\kappa K}{\lambda} \quad \Rightarrow \quad \hat{L} = \hat{u} + \hat{\kappa} + \hat{K} - \hat{\lambda}. \tag{4}$$

A closed model is formed by specifying equations for the growth rates that appear in this equation ($\hat{u}$, $\hat{\kappa}$, $\hat{K}$, and $\hat{\lambda}$) expected inflation $\hat{p}^e$, and realised inflation $\hat{p}$. We provide an example in the next section.

As an aside, we can connect to the broader conflict inflation literature by using the identity $L = elN$, where e is the employment rate, l is the labour participation rate, and N is the working-age population. Then $\hat{L} = \hat{e} + \hat{l} + n$, and

$$\hat{\omega} = \hat{\lambda}^s - \hat{\lambda} + \hat{p}^e - \hat{p} + f(\hat{e} + \hat{l}; \boldsymbol{x}, t). \tag{5}$$

Over a short time during which labour participation is essentially constant ($\hat{l} \simeq 0$) and assuming instantaneous accomodation to labour productivity growth ($\hat{\lambda}^s = \hat{\lambda}$), this reduces to a behavioural equation like that of Boddy (2009, Eq. 4). In Boddy's model, the wage share depends on both the level and rate of change of the unemployment rate, as well as the rate of change of capacity utilisation. Setting $\boldsymbol{x} = (e, \hat{u})$ aligns the behavioural equation proposed in this paper with Boddy's.

To motivate the model as developed in this paper, in which L is expressed as in Eq. (4), consider a stationary state characterised by steady growth in which the goods market equilibrium yields a curve in the u^*-ω^* plane $G(u^*, \omega^*) = 0$ while other, as yet unspecified, dynamics (aside from Eq. 3) yields the following:

$$\hat{K} = \gamma(u^*, \omega^*), \; \hat{\lambda}^s = \hat{\lambda} = a, \; \hat{p}^e = \hat{p}, \; \hat{\kappa} = \hat{u} = 0. \tag{6}$$

Imposing $\hat{\omega} = 0$ on Eq. (3) and taking Eq. (4) into account then implies

$$\gamma(u^*, \omega^*) = a + n. \tag{7}$$

The distributional equilibrium defines a curve in the u^*-ω^* plane, a result found in Blecker and Setterfield (2019, p. 221) as well. On the curve defined by Eq. (7), the growth rate is equal to Harrod's natural rate. The emergence of the natural rate at equilibrium is an important motivation for proposing the behavioural rule in Eq. (1) beyond the conceptual motivation illustrated in Fig. 1 and the simplification of abstracting from the unemployment and participation rates.

The equilibrium solution (u^*, ω^*) lies at the intersection of the goods market equilibrium curve and Eq. (7). Distribution is fully determined, together with capacity utilisation. In the exemplary closed model proposed in the next section, persistent inflation arises because firms compete for finance – the Marxian 'competition for capitals'. Thus, conflict in reality is between firms, although mathematically firms' aspirational target is in conflict with the equilibrium value ω^* as determined by the model parameters. Labour-firm conflict is latent, emerging when employment demand becomes misaligned with labour availability.

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with precarious labour that cannot effectively bargain for its desired wage, and a 'non-essential' sector that is able to bargain effectively. Further suppose that a share σ of non-essential sector worker expenditure is on essential goods. Then the non-essential workers' inflation rate is $\sigma\hat{p}_e + (1-\sigma)\hat{p}_n$, where a subscript e denotes 'essential' and n denotes 'non-essential'. The non-essential workers' nominal wage is w_n. In this case,

$$\hat{w}_n = \hat{\lambda}^s + \hat{p}_n^e + \sigma\,(\hat{p}_e^e - \hat{p}_n^e) + f(\hat{L}_n - n_n; \boldsymbol{x}, t), \tag{2}$$

where n_n is the growth in the number of people of working age who are qualified to work in the non-essential sector. As this equation shows, wage demands from non-essential workers can be kept in check during an expansion by ensuring a low relative rate of essential goods inflation. Conversely, essential goods inflation can spark demands from non-essential workers for wage increases.

[2]The meaning of 'behaviourally consistent' depends on the model. In a one-good economy, the value of capital is unambiguous. Otherwise, if firms and their investors watch debt-to-asset ratios or return on prior investment to determine performance, then a GAAP-compliant monetary value of the capital stock is relevant.

3 An exemplary closed model

The proposed behavioural rule in Eq. (1) can be elaborated in many ways to generate a closed model. For concreteness, a specific set of choices are made in this paper. The goal is to construct a model that is sufficiently complex to be interesting but not so complex that results cannot be readily traced to their causes. With this end in view, $f(\cdot)$ is assumed to be independent of $\boldsymbol{x}$ and t: $f(\hat{L} - n; \boldsymbol{x}, t) \to f(\hat{L} - n)$. Also, the number of independent variables is limited to three, a goal that is achieved in part by assuming instantaneous accommodation to labour productivity growth: $\hat{\lambda}^s = \hat{\lambda}$. Because these assumptions exclude some interesting dependencies, alternatives are discussed in a later section. With these assumptions, the behavioural rule in the exemplary closed model is

$$\hat{\omega} = \hat{p}^e - \hat{p} + f(\hat{L} - n). \tag{8}$$

3.1 Growth and capacity utilisation

We assume investment and saving functions $g^i(u, \pi, i)$ and $g^s(u, \pi, i)$ that are increasing in capacity utilisation and the profit share $\pi = 1 - \omega$. The investment function is decreasing in the interest rate i, while the saving function is increasing in i. The growth in the capital stock is then

$$\hat{K} = g^i(u, \pi, i) - \delta, \quad g^i_u, g^i_\pi > 0,\ g^i_i < 0. \tag{9}$$

The saving function $g^s(u, \pi, i)$ satisfies $g^s_u, g^s_\pi, g^s_i > 0$. Define

$$\Gamma(u, \pi, i) \equiv g^s(u, \pi, i) - g^i(u, \pi, i). \tag{10}$$

Because the difference between saving and investment is the net change of inventories, $\Gamma(u, \pi, i)$ is the net growth rate of inventories divided by the capital stock. Note that the assumed dependence of g^s and g^i on the inflation rate i imply that $\Gamma_i > 0$.

We assume that firms adjust capacity utilisation in response to inventories, increasing utilisation when inventories fall and decreasing it when inventories rise. Specifically, we propose

$$\hat{u} = -\psi\Gamma. \tag{11}$$

Aside from shifting from a simple time derivative ($\dot{u}$) to a growth rate ($\hat{u}$), this is identical to the dynamic equation for capacity utilisation in Lavoie (2022, Eq. 6.17). We impose the Keynesian stability condition, in which saving responds more strongly than investment to a change in capacity utilisation, which then implies

$$\Gamma_u > 0. \quad \text{(Keynesian stability condition)} \tag{12}$$

At the goods market equilibrium, $\Gamma(u^*, \pi^*, i) = 0$. That defines an i-dependent curve in the (u^*, π^*) plane, which satisfies

$$\frac{du^*}{d\pi^*} = -\frac{\Gamma_\pi}{\Gamma_u}. \tag{13}$$

From this it follows that the economy is wage-led if $\Gamma_\pi > 0$ – that is, saving responds more readily to a change in profits than does investment – and profit-led if $\Gamma_\pi < 0$. A further condition that will prove useful later follows from the condition at the goods market equilibrium that the investment and savings rates are equal, $g^i(u^*, \pi^*, i) = g^s(u^*, \pi^*, i) = g$. The equilibrium investment rate then responds to a change in the profit share as

$$\frac{dg}{d\pi^*} = \frac{g^i_\pi \Gamma_u - g^i_u \Gamma_\pi}{\Gamma_u}. \tag{14}$$

If the economy is profit-led (so that $\Gamma_\pi < 0$), then the equilibrium investment rate rises when the profit share rises: $dg/d\pi^* > 0$. However, if the economy is wage-led, then the investment rate can respond either positively or negatively to a rise in the profit share. We therefore distinguish between profit-led, weakly wage-led, and strongly wage-led growth regimes, as summarised in Table 1.

Empirical evidence suggests that closed economies are wage-led. Taking Stockhammer and Onaran (2013) as characteristic of this literature, components of demand are regressed on a distributional variable. The coefficients are then used to estimate the impact of a change in distribution on income. In the terminology of Table 1, this is a test for a weakly wage-led regime. We therefore assume that the modeled economy is at least weakly wage-led and may be strongly wage-led.

	$du^*/d\pi^*$	$dg/d\pi^*$
Profit-led	+	+
Weakly wage-led	-	+
Strongly wage-led	-	-

Table 1: Types of growth regimes

3.2 Technological change

Contributions to the conflict inflation literature often assume constant labour productivity to carry out short-run analysis (Blecker and Setterfield, 2019, chap. 5 being a notable exception). However, the focus in this paper on long-run growth together with medium-run changes in distribution. This suggests representing technological change as driven by two mechanisms: a Kaldor-Verdoorn growth dependence, as is standard in post-Keynesian theory; and cost share-induced technological change, which is more commonly encountered in the classical and Marxian literature (Dutt, 2013). The two are combined in the Kaleckian models of Cassetti (2003) and Hein and Tarassow (2010); we combine them in this paper as well.

Following Kemp-Benedict (2022), which builds on the work of Duménil and Lévy (1992, 2010), both capital and labour productivity growth are allowed (but not required) to depend on distribution. The assumed productivity dynamics are:

$$\hat{\lambda} = a(\omega) + bg^i, \quad a' \geq 0,\ 0 \leq b < 1, \tag{15a}$$
$$\hat{\kappa} = k(\omega), \quad k' \leq 0. \tag{15b}$$

This specification includes as a special case the standard post-Keynesian assumptions ($a' = 0$, $k' = 0$), either with ($b > 0$) or without ($b = 0$) the Kaldor-Verdoorn term.

3.3 Inflation expectations

Hein and Häusler (2024) identify two distinct approaches to representing inflation expectations. One, based on the work of Blecker and Setterfield (2019) and Lavoie (2024) assumes partial pass-through of inflation to wages. While this assumption is motivated by observation, it is not the only interpretation. Another possibility, which is followed by Hein and Stockhammer (2010), is that inflation is fully passed through but with a long adjustment time. The 'Hein-Stockhammer' approach is adopted in this paper by assuming adaptive expectations for expected inflation,

$$\dot{\hat{p}}^e = -\beta_i \left(\hat{p}^e - \hat{p}\right). \tag{16}$$

The realised price is the one set by oligopolistic firms. Firms target a markup on labour costs, but they do not all adjust their prices at once, so in the aggregate, the price approaches the target price over time,

$$\dot{p} = \beta_p \left(\mu \frac{w}{\lambda} - p\right) \quad \Rightarrow \quad \hat{p} = \beta_p \left(\mu\omega - 1\right). \tag{17}$$

Between Eqs. (16) and (17), inflation expectations and price are each determined through an adaptive expectations mechanism, consistent with Rowthorn's staggered and uncoordinated markets (Rowthorn, 2024, p. 1309).

Combining Eqs. (8), (4), (11), (16), and (17), the dynamic system for the exemplary model is

$$\hat{\omega} = \hat{p}^e - \beta_p \left(\mu\omega - 1\right) + f\left(-\psi\Gamma + (1-b)g^i - \delta + k(\omega) - a(\omega) - n\right), \tag{18a}$$
$$\hat{u} = -\psi\Gamma, \tag{18b}$$
$$\dot{\hat{p}}^e = -\beta\left[\hat{p}^e - \beta_p\left(\mu\omega - 1\right)\right]. \tag{18c}$$

This is a system with three equations and three unknowns, so the dynamics are fully determined. They are influenced by the interest rate i, which enters the expressions for g^i and Γ, firms' target markup factor μ, and the growth rate of the working age population n.

4 Analysis of the exemplary model

This section explores the properties of the exemplary model. Some of the findings follow directly from the proposed behavioural rule in Eq. (1) while others depend on the details of the model; alternative assumptions are discussed in Section 5. This sections starts with the equilibrium conditions, which are then applied to a comparative statics exercise, followed by a stability analysis.

4.1 Equilibrium

The equilibrium conditions are found by setting the left-hand sides of Eqs. (18) to zero, with the result

$$g^i(u^*, 1-\omega^*, i) = \frac{\delta - k(\omega^*) + a(\omega^*) + n}{1-b}, \tag{19a}$$

$$g^s(u^*, 1-\omega^*, i) = g^s(u^*, 1-\omega^*, i) \quad \text{(or, equivalently, } \Gamma(u^*, 1-\omega^*, i) = 0\text{)}, \tag{19b}$$

$$\hat{p}^{e*} (= \hat{p}^*) = \beta_p \left(\mu\omega^* - 1\right). \tag{19c}$$

Given a value for the interest rate i, the equilibrium levels of the wage share and capacity utilisation, ω^* and u^*, are fully determined by Eqs. (19a) and (19b). Those levels then determine the inflation rate through Eq. (19c).

Eq. (19a), which determines the investment rate, ensures that the pace of investment is consistent with the growth rate of the working age population, adjusted for capital and labour productivity. It is therefore a generalisation of Harrod's natural rate that takes the Kaldor-Verdoorn term into account and allows capital productivity to change. Eq. (19b) imposes the goods market equilibrium.

Inflation in the model arises from a mismatch between firms' desired markup μ and the equilibrium markup, which is equal to $1/\omega^*$. Whether markups are set in post-Keynesian terms as the means by which firms acquire power over their environment (Lavoie, 2022, chap. 3) or in classical terms as driven by competition for capitals, there is an incentive for firms to seek above-average returns. This suggests that, typically, $\mu > 1/\omega^*$, regardless of the value of ω^*. The result is a bias towards inflation under oligopolistic competition. In this model, sellers' inflation (Lerner, 1958) driven by inter-firm competition is always present, with deviations arising from conflicting claims between workers and firms. However, the model does not take account of opportunistic sellers' inflation in response to cost shocks as explored by Weber et al. (2025).

4.2 Comparative statics

The location of the equilibrium depends on the interest rate i. To first order, the impact of a change in the interest rate on the equilibrium values for ω and π are given by the system

$$g^i_u \Delta u - g^i_\pi \Delta\omega + g^i_i \Delta i = \frac{a' - k'}{1-b}\Delta\omega, \tag{20a}$$

$$\Gamma_u \Delta u - \Gamma_\pi \Delta\omega + \Gamma_i \Delta i = 0. \tag{20b}$$

As noted above, inflation as expressed in Eq. (19c) is a residual, determined by the joint solution to Eqs. (19a) and (19b). Once the system given by Eqs. (20) is solved, the change in the inflation rate can be calculated from $\Delta\hat{p}^{e*} = \beta_p \mu \Delta\omega^*$.

Before proceeding, the multiplier of $\Delta\omega$ on the right-hand side of Eq. (20a) will recur in the stability analysis. For convenience, we define a new composite variable Θ as

$$\Theta \equiv \frac{a' - k'}{1-b} \geq 0. \tag{21}$$

This variable, which depends on ω, contains all of the technological change parameters in the model: the Kaldor-Verdoorn coefficient b, as well as the cost-share dependence of labour and capital productivity $a(\omega)$ and $k(\omega)$. It is zero if there is no cost share-induced technological change mechanism and is positive otherwise.

The system given by Eqs. (20) is solved in Appendix A. A key result is that the expected results $du^*/di < 0$ and $d\omega^*/di < 0$ arise only when the following condition holds:

$$\frac{dg}{d\pi^*} > -\Theta. \tag{22}$$

Because $-\Theta \leq 0$, when the left-hand side of this inequality is positive the inequality is always satisfied. That condition holds whenever the economy is either profit-led or weakly wage-led (see Table 1). However, if the economy is strongly wage-led – that is, $dg/d\pi^* < 0$ – then the inequality will hold only in the presence of cost share-induced technological change. Moreover, it will be stable only if Θ is larger in magnitude than $dg/d\pi^*$.

Below, we will show that the condition in Eq. (22) is necessary (although not sufficient) for stability. Therefore, if the system is stable, then $du^*/di < 0$ and $d\omega^*/di < 0$ as expected. Because $\Delta\hat{p}^{e*} = \beta_p \mu \Delta\omega^*$, we find under the same conditions that $d\hat{p}^{e*}/di < 0$ as well. Again, this is as expected – if firms do not change their markups, then raising the interest rate tames the (wage-based) inflation rate.

4.3 Stability

We carry out a local stability analysis. We denote deviations of ω, u, and $\hat{p}^e$ from their equilibrium values by x, y, and z, respectively:

$$\omega = \omega^* + x, \tag{23a}$$
$$u = u^* + y, \tag{23b}$$
$$\hat{p}^e = \hat{p}^{e*} + z. \tag{23c}$$

For the local stability analysis, we work to first order in deviations. Defining $\phi \equiv f'(0)$, and suppressing arguments (e.g., $g^i = g^i(u^*, 1-\omega^*, i)$), the first-order system is[3]

$$\dot{x} = \omega^* \left\{ z - \beta_p \mu x + \phi \left[-\psi \left(-\Gamma_\pi x + \Gamma_u y \right) - (1-b) \left(g^i_\pi + \Theta \right) x + (1-b) g^i_u y \right] \right\}, \tag{24a}$$
$$\dot{y} = -u^* \psi \left(-\Gamma_\pi x + \Gamma_u y \right), \tag{24b}$$
$$\dot{z} = -\beta_i \left(z - \beta_p \mu x \right). \tag{24c}$$

The stability conditions for this system are detailed in Appendix B. In a profit-led regime, the system is absolutely stable. Otherwise, it is possible for instabilities to arise. Among the most constraining stability conditions is that the inequality (22) hold. As discussed above, this means that in a strongly wage-led economy, the cost share-induced technological mechanism must be sufficiently strong that it overcomes the tendency of a rise in the wage share to stimulate output.

The formulation of the model in Eqs. (24) allows for a further connection to the literature. Sawyer (2024, Eq. 5) includes in the dynamic equation for the wage an error-correction term given by the deviation from the target real wage. The terms multiplying x in Eq. (24a) play a similar role, but in this case x is a deviation from the equilibrium wage share. Econometric tests alone cannot distinguish between these two possibilities.

5 Discussion

This paper proposed a behavioural rule, Eq. (1), in which the nominal wage tends to track both inflation and labour productivity. Deviations from that tendency arise when the growth in demand for labour outstrips (falls below) the growth in size of the working-age population. Unemployment and labour participation implicitly change in the process, but they are not explicitly modelled.

The proposed behavioural equation connects to conflict inflation models in the literature as noted throughout the body of the paper (e.g., Boddy, 2009; Hein and Stockhammer, 2010; Blecker and Setterfield, 2019). However, the essential driver – the gap between the growth in labour demand and supply – has appeared in Marxian models of labour productivity growth (Bhaduri, 2006; Dutt, 2006). The proposed behavioural rule combines insights from both literatures.

While the proposed behavioural rule can be incorporated into a variety of models, this paper offers a specific closure in a three-variable model for concreteness. The exemplary model is stable in a profit-led economy. In the more empirically relevant case of a wage-led economy the model may require cost share-induced technological change for stability. When the model is stable, the response to a rise in the interest rate is as expected: the inflation rate declines (as long as firms maintain their target profit margins), as do the wage share and capacity utilisation. When productivities respond to changes in distribution – that is, the cost share-induced technological change mechanism is active – raising the interest rate lowers the equilibrium investment rate. Otherwise, the investment rate is unaffected by the interest rate.

[3]Note that $\partial g^i/\partial\omega = -g^i_\pi$ and $\partial\Gamma/\partial\omega = -\Gamma_i$.

The exemplary model can be extended in a number of directions. Among the most direct is to impose adaptive expectations for the smoothed labour productivity growth rate $\hat{\lambda}^s$ similar to the model for the expected inflation rate. A second is to model a dual labour market along the lines indicated in Footnote 1. Additional extensions include persistent overhead labour over the business cycle (Lavoie, 2022, Sec. 5.5) and an inflation target.

The investment and saving functions can be modified by specifying dependence on real inflation (that is, replacing i with either $i - \hat{p}$ or $i - \hat{p}^e$). Additionally, the investment function could be specified as depending the profit rate $r = \pi\kappa$, perhaps adjusted for inflation. The pricing rule for firms could be altered, for example, replacing the fixed markup with target-return pricing.

Additional modifications are suggested by the specific behavioural rule proposed in this paper. In particular, the exemplary model does not allow for very high labour participation. This can be remedied by adding to the covariates $\boldsymbol{x}$ in Eq. (1) the gap between the working age population N and the level of employment L. When the working age population becomes a real constraint, inflation is expected to rise more rapidly. Alternatively, the growth rate n of the working age population can be endogenised. Absolute labour constraints can and have been lifted by expanding the working age population – for example, through immigration, raising the retirement age, or lowering the legal minimum working age.

6 Conclusion

Conflict inflation models have a long pedigree (Barbieri Góes et al., 2024; Rowthorn, 2024). This paper contributes to the literature in at least three ways. First, it abstracts from both unemployment and labour participation by adapting a behavioural rule that has been applied to labour productivity growth (Bhaduri, 2006; Dutt, 2006). Specifically, workers gain an advantage when labour demand growth rises above the growth rate of the working age population and firms gain an advantage in the opposite situation.

For concreteness, the paper embeds the proposed behavioural rule into an example closed model. In the exemplary model, steady inflation arises from inter-firm competition. In their pursuit of competitive profits, firms routinely set their markups above the equilibrium level as determined in the model. Inflation then fluctuates about that level depending on the state of the labour market. The exemplary model is stable when the economy is profit-led. However, as empirical tests suggest that closed economies are wage-led, instabilities can arise. They are kept in check when productivity growth rates are responsive to distribution – that is, under cost share-induced technological change.

The behavioural rule proposed in this paper can be embedded in a variety of models. The resulting models may give different results to those found for the exemplary model. However, one result that is likely to persist is that the behavioural rule drives the economy towards Harrod's natural rate of growth. This result, combined with the simplification made possible by abstracting from the unemployment and participation rates, suggests that the proposed behavioural rule is a useful addition to applied Kaleckian growth models.

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A Comparative statics

The system in Eqs. (20) can be written in matrix form as

$$\begin{pmatrix} -g^i_u & g^i_\pi + \Theta \\ -\Gamma_u & \Gamma_\pi \end{pmatrix} \begin{pmatrix} \dfrac{du^*}{di} \\ \dfrac{d\omega^*}{di} \end{pmatrix} = \begin{pmatrix} g^i_i \\ \Gamma_i \end{pmatrix}. \tag{A1}$$

Solving this equation gives the following expressions:

$$\frac{du^*}{di} = -\frac{g^i_\pi \Gamma_i - g^i_i \Gamma_\pi + \Theta \Gamma_i}{g^i_\pi \Gamma_u - g^i_u \Gamma_\pi + \Theta \Gamma_u}, \tag{A2a}$$

$$\frac{d\omega^*}{di} = -\frac{g^i_u \Gamma_i - g^i_i \Gamma_u}{g^i_\pi \Gamma_u - g^i_u \Gamma_\pi + \Theta \Gamma_u}. \tag{A2b}$$

The analysis in Appendix B shows that the denominator must be positive for stability. In that case, both of these expressions are negative, indicating that a rise in the interest rate depresses economic activity (as reflected by u^*) and wages (through ω^*). These results align with standard expectations.

The change in the equilibrium investment rate is given by

$$\begin{aligned} \frac{dg}{di} &= g^i_u \frac{du^*}{di} - g^i_\pi \frac{d\omega^*}{di} + g^i_i \\ &= -\frac{g^i_i (g^i_\pi \Gamma_u - g^i_u \Gamma_\pi) + \Theta g^i_u \Gamma_i}{g^i_\pi \Gamma_u - g^i_u \Gamma_\pi + \Theta \Gamma_u} + g^i_i & \text{(A3)} \\ &= -\frac{\Theta \left(g^i_u \Gamma_i - g^i_i \Gamma_u \right)}{g^i_\pi \Gamma_u - g^i_u \Gamma_\pi + \Theta \Gamma_u}. & \text{(A4)} \end{aligned}$$

When the denominator is positive, this is either zero or negative. It is zero in the absence of a cost share-induced technological change mechanism (so that $\Theta = 0$). In this case, a change in the interest rate has no long-run impact on the investment rate because the investment rate is fully determined by the growth rate of the labour force and the (fixed) technical coefficients. If $\Theta > 0$, then a rise in the interest rate depresses investment, again in line with standard expectations.

B Stability conditions

Define, for convenience,

$$A \equiv -\beta_p \mu + \phi \left[\psi \Gamma_\pi - (1-b) \left(g^i_\pi + \Theta \right) \right], \tag{B1a}$$

$$B \equiv -\phi \left[\psi \Gamma_u - (1-b) g^i_u \right], \tag{B1b}$$

the dynamic equations near the equilibrium can be written in matrix form as

$$\begin{pmatrix} \dot{x} \\ \dot{y} \\ \dot{z} \end{pmatrix} = \begin{pmatrix} \omega^* A & \omega^* B & \omega^* \\ u^* \psi \Gamma_\pi & -u^* \psi \Gamma_u & 0 \\ \beta_i \beta_p \mu & 0 & -\beta_i \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix}. \tag{B2}$$

The characteristic equation for the eigenvalues s is

$$(\omega^* A - s)(u^* \psi \Gamma_u + s)(\beta_i + s) + \omega^* B u^* \psi \Gamma_\pi (\beta_i + s) + \omega^* \beta_i \beta_p \mu (u^* \psi \Gamma_u + s) = 0. \tag{B3}$$

Writing this as

$$a_3 s^3 + a_2 s^2 + a_1 s + a_0 = 0, \tag{B4}$$

the coefficients are

$$a_3 = -1, \tag{B5a}$$

$$a_2 = \omega^* A - u^* \psi \Gamma_u - \beta_i, \tag{B5b}$$

$$a_1 = \omega^* A (\beta_i + u^* \psi \Gamma_u) - \beta_i u^* \psi \Gamma_u + \omega^* B u^* \psi \Gamma_\pi + \omega^* \beta_i \beta_p \mu \tag{B5c}$$

$$a_0 = \omega^* A \beta_i u^* \psi \Gamma_u + \omega^* B u^* \psi \Gamma_\pi \beta_i + \omega^* u^* \psi \beta_i \beta_p \mu \Gamma_u. \tag{B5d}$$

The coefficient for s^3, a_3 is straightforward. For the others, substituting for A and B from Eqs.(B1),

$$a_2 = -\omega^*\beta_p\mu - \beta_i - \psi\left(u^*\Gamma_u - \omega^*\phi\Gamma_\pi\right) - \omega^*(1-b)\left(g^i_\pi + \Theta\right). \tag{B6}$$

Then,

$$\begin{aligned} a_1 = -\phi u^*\omega^*\psi(1-b)\left(g^i_\pi\Gamma_u - g^i_u\Gamma_\pi + \Theta\Gamma_u\right) - u^*\psi\left(\omega^*\beta_p\mu + \beta_i\right)\Gamma_u \\ - \phi\beta_i\omega^*\left[(1-b)\left(g^i_\pi + \Theta\right) - \psi\Gamma_\pi\right]. \end{aligned} \tag{B7}$$

and

$$a_0 = -\phi\omega^* u^*\psi\beta_i(1-b)\left(g^i_\pi\Gamma_u - g^i_u\Gamma_\pi + \Theta\Gamma_u\right). \tag{B8}$$

Because $a_3 < 0$, the Routh-Hurwitz conditions are: 1) $a_0, a_1, a_2 < 0$; and 2) $a_1 a_2 > a_0 a_3$. Both conditions are always satisfied in a profit-led economy in which $\Gamma_\pi < 0$. Otherwise, instabilities may but are not certain to arise.