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Conflict inflation and autonomous demand: a supermultiplier model with endogenous distribution

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Abstract

The disciplinary role of unemployment has long been acknowledged in economic theory. Seminal works on conflict inflation have included the unemployment rate as a determinant of workers' bargaining power, which thus affects distribution and inflation (Rowthorn, 1977). In extensions to the long run, however, conflict inflation models have shifted away from this analytical approach and replaced the unemployment rate with the rate of change in unemployment as a determinant of workers' claim (Cassetti, 2002; Lavoie, 2022). A similar approach is found in Nah and Lavoie (2019), who introduced conflict inflation in an autonomous demand-led growth model in which the unemployment rate – contrarily to empirical evidence – has no permanent effect on wage claims and income distribution We propose here an alternative way to combine conflict inflation and autonomous demand-led growth in a Sraffian supermultiplier model. We introduce the unemployment rate as a determinant of workers' claim in a conflicting claims model. Modeling of the labor market relies on an endogenous adjustment of labor supply to demand (Fazzari, Ferri, and Variato, 2020). We extend the typical results of short-run conflict inflation models to the long run, finding that high (low) unemployment rate reduces (increases) both the equilibrium wage share and conflict inflation. By incorporating income distribution as an endogenous factor through a conflicting claims process, we establish a direct relationship between the growth rate of autonomous demand and the wage share. This relation discloses a conflict underlying the determinants of autonomous demand growth. We conclude that in the political economy of growth and distribution it is crucial to consider the impact of autonomous demand growth on workers' bargaining power and income distribution.

JEL classification: B51, E11, E24, E31, O41.

Keywords: Phillips curve; Sraffian supermultiplier; demand-led growth; autonomous demand; inflation; distributive conflict.

1. Introduction

The disciplinary role of unemployment has long been acknowledged in economic theory. The rationale is straightforward: high unemployment weakens workers' bargaining power as the threat of being fired becomes more significant, and employers can easily replace fired employees with those from the pool of unemployed. Consequently, unemployment helps keep wage claims at bay, reducing wage increases. Classical economists recognized that periods of rapid capital accumulation could lead to a "scarcity of hands", which improved workers' bargaining position, increasing the wage rate (Stirati, 1994). Other classical references include Marx (2007 [1867])'s concept of a reserve army of labor, and Kalecki (1943) notion of a political constraint to full employment. Similar ideas can be found also in contemporary mainstream handbooks (see, e.g., Carlin and Soskice, 2015, and Blanchard, Amighini, and Giavazzi, 2021).

The distributive effect of unemployment is at the heart of conflict inflation theory (Rowthorn, 1977). When unemployment is low, workers experience greater power in wage bargaining, increasing wage growth and inflation, but also ensuring real gains. The empirical regularity captured in the Phillips curve, therefore, can be understood as an outcome of wage bargaining and conflict inflation. This feature of capitalist economies was recently summarized in a series of tweets by Olivier Blanchard (2022), who speaks of "low unemployment, leading to increases in nominal wages given prices, and increases in prices given nominal wages, and so on" (see also Lavoie and Rochon, 2023). Recently, the view that inflation is a result of social conflict has gained traction within mainstream economics (Lorenzoni and Werning, 2023).

In this article, we integrate a conflict inflation mechanism into an autonomous demand-led growth model. We propose a Sraffian supermultiplier model, in which growth is driven by autonomous demand, with an endogenous distribution according to a conflict inflation process. Usually, autonomous demand-led growth models – as well as most versions of the Neo-Kaleckian growth model – treat income distribution as an exogenous variable. This does not imply, of course, that distribution is constant, unexplainable, or unaffected by growth. Rather, it reflects the Classical standpoint according to which the determination of distributive variables and income shares, on the one hand, and of the level and growth of output on the other, belong to two distinct logical stages (Garegnani, 1984, 1990). The same strand of literature acknowledges that growth has persistent effects on the balance of power among social classes (Steindl, 1979).

Our starting point is akin to that of Nah and Lavoie (2019) and Brochier (2020), who integrate the supermultiplier with conflict inflation and an endogenous labor supply. Nonetheless, we distance ourselves from these works inasmuch as we introduce the unemployment rate – and not its rate of change or the rate of change of employment – as a determinant of workers' wage claims. The main consequence of this assumption is that we conclude that unemployment has permanent effects on distribution (rather than only temporary ones, as in the cited works). Our results allow for the extension of the Phillips curve to a long-run horizon, in line with the conflict-augmented Phillips curve (Serrano, 2019). Although our contribution presents a few similarities with Serrano (2019) in framing the relationship between conflict inflation and growth, we move forward by providing an in-depth discussion on the outcomes for income distribution and the stability analysis of the model, and by discussing the political economy implications of different regimes of inflation and growth.

Crucial results for understanding conflict inflation, distribution, and the political economy of growth emerge from our analysis. In particular, we find: (a) an inverse relation between the unemployment rate and inflation, in line with the traditional, old-school (i.e., non-accelerationist) Phillips curve; (b) an inverse relation between the growth rate of autonomous demand and the unemployment rate; and, for this reason, (c) a direct relation between the growth rate of autonomous demand and the wage share. The relationship described in (c) exposes a conflict underlying the determination of a growth pattern for autonomous demand, particularly through the role of fiscal and monetary policies. Hence, our conclusions represent an analytical counterpart to recent works such as Mattei (2022), who provides historical evidence of the effectiveness of austerity policies in taming workers' bargaining power and depressing wages. We also contribute to growth theory by highlighting an often neglected feature of autonomous demand-led growth models: if the proximate causes of growth are to be found in the dynamics of autonomous demand, the ultimate causes can only be discovered by looking at the political and social determinants of autonomous demand (Morlin, Passos, and Pariboni, 2022). Therefore, we show how upper and lower limits for the growth of autonomous demand emerge in the model, given the pressure of distributive conflict, on one side, and unemployment, on the other.

The paper is structured as follows. Section 2 surveys the main works relating unemployment and inflation in post-Keynesian literature. Section 3 develops a conflict inflation model in which workers' claims respond to the unemployment rate. Conflict inflation is integrated into a supermultiplier growth model, and the implications for the Phillips curve are discussed. In Section 4, we explore how analyzing the relationship between inflation, unemployment, and growth can inform our understanding of the political economy of growth by defining boundaries for the growth of autonomous demand. A final section concludes that macroeconomic policy is another dimension of class conflict due to its consequences for distribution and unemployment.

2. Unemployment, inflation, and distribution

Unemployment tilts the balance of power in favor of capitalists in the dispute among classes for the distribution of the social product. Classical economists understood that during periods of fast paced capital accumulation the "scarcity of hands" would improve the bargaining position of workers, allowing for an increase in the wage rate (Stirati, 1994). Marx (2007[1867]) introduced the concept of a reserve army of labor to analyze this phenomenon. Kalecki (1943) associated the disciplinary role of unemployment with macroeconomic policy decisions. Steindl (1979) extended Kalecki's conclusions on the political business cycle to long-run trends in policy regimes and economic growth.

The distributive effect of unemployment reappears in modern macroeconomics in the conflict inflation theory (Rowthorn, 1977). In a seminal work, Rowthorn (1977) included the unemployment rate as a determinant of workers' bargaining power, thus affecting inflation and distribution.[1] Conflict inflation theory argues that a fall in unemployment (due to, for instance, an increase in aggregate demand) enhances workers' bargaining power, thus increasing the average growth rate of money wages (Rowthorn, 1977; Arestis and Sawyer, 2005). Conflict inflation theory, therefore, can explain the empirical regularity found in the Phillips curve. While the old inverse relation between inflation and unemployment became discredited after the dominance of the accelerationist Phillips curve, recent empirical evidence suggests that the old Phillips curve fits macroeconomic data better (Blanchard, 2016). The conflict inflation approach was further developed into analyses of macroeconomic policy (see, for instance, Rochon and Setterfield, 2012, Hein and Stockhammer, 2010).[2]

Few works have modeled conflict inflation and unemployment in a long-term perspective. In fact, most long-term analyses have replaced the unemployment rate with the rate of change of the employment rate as a determinant of workers' income claim (see, e.g., Cassetti, 2003; Lavoie, 2022). Analytical tractability is likely to explain why authors have followed this modeling strategy. One of the problems would be that "the change in the rate of unemployment is roughly equal to the discrepancy between the natural rate of growth and the actual growth rate of output, so that the rate of unemployment keeps changing as long as these two rates are not equal to each other" (Lavoie, 2022, p. 613). In other words, without an endogenous convergence of the unemployment rate, the conflict inflation model cannot achieve equilibrium if workers' claim depends on the unemployment rate. The alternative is

[1]As long as inflation remains below a given threshold. Otherwise, inflation expectations are considered in wage bargaining and firms' pricing. In that case, "inflation is fully anticipated and exercises no redistributive effect" (Rowthorn, 1977, p. 227).

[2]Summa and Braga (2020) provide a review of mainstream and post-Keynesian interpretations of the Phillips curve.

to “suppose that the real-wage rate targeted by workers is a function of the rate of growth of unemployment, rather than the level of unemployment” (Lavoie, 2022, p. 613). This modeling strategy appears in Cassetti (2003) Nah and Lavoie (2019), Brochier (2020).

An additional difficulty lies in the feedback effects between unemployment, higher wage shares, and aggregate demand, which can indeed cause limit cycles or unstable dynamics (Dutt, 1992). As argued by Lavoie (2022, pp. 613–614), “[i]f we were to suppose that the real-wage target of workers depends on the level of unemployment [. . .] complex interactions with limit cycles and the like would arise”. This is particularly important if workers have strong bargaining power in a wage-led growth scenario.[3] However, this source of instability may be, at least partially, tamed in the case of a weaker relation between growth and distribution, such as the one proposed in the supermultiplier approach.

Notwithstanding empirical evidence that suggests otherwise,[4], the level of unemployment has no permanent effect on income distribution in the models that assume that the change in unemployment determines workers’ bargaining power. While falling unemployment increases workers’ ability to obtain higher wages in these models, a stable but low unemployment rate would not have similar consequences. In this regard, Cassetti (2003, p. 454) argues that “what really affects the workers’ bargaining strength is the fear of unemployment”, which would depend, in this view, on the evolution of the unemployment rate, rather than on its level.[5]

In this article, we follow those original versions of conflict inflation models that included the unemployment rate[6] among the determinants of the wage claims. To overcome the analytical complications underlined by Lavoie, we adopt a two-step strategy. First, we model the growth trajectory of the economy following the recent wave of autonomous demand-led

[3]See also Stockhammer (2004), Sasaki (2013), Nishi and Stockhammer (2020). Lavoie and Stockhammer (2013) argue that the potential instability in wage-led demand regimes, associated with the feedback effects of employment and aggregate demand on income distribution, could be balanced by the growth of productivity. In this case, fast output growth does not necessarily imply fast employment growth, due to the Kaldor-Verdoorn effect (see Storm and Naastepad, 2013).

[4]See, e.g., Stirati and Paternesi Meloni (2021) where the authors investigate the long-run relation between unemployment and the wage share and find a negative impact of the former on the latter, and Paternesi Meloni and Stirati (2022), where labor market slack is detected to exert an impact on the labor share. See also section 4.1 of Paternesi Meloni and Stirati (2022) for a review of the literature on the issue.

[5]Bloch, Dockery, and Sapsford (2004) argue in the same direction, supported by empirical evidence. However, the recent evidence supporting a downward sloping Phillips curve better fits the view that the unemployment rate (rather than its rate of change) is the labor market variable affecting workers’ bargaining power. See also footnote 4 on the relationship between unemployment and wages.

[6]A more complex theoretical model could include measures of labor market slack broader than the unemployment rate. Along these lines, Shaikh (2016) develops an index of unemployment intensity that takes into consideration unemployment jointly with unemployment duration. Bell and Blanchflower (2021) discuss the role played by underemployment. Paternesi Meloni and Stirati (2022) include in their empirical analysis the diffusion of involuntary part-time, unemployment duration and several other indicators such as participation and employment rates.

growth models a là Sraffian supermultiplier (Serrano, 1995). The Sraffian supermultiplier does not posit a persistent relation between income distribution and growth (Freitas and Serrano, 2015). While an increase in the wage share can boost demand due to an increase in consumption — following the increase in the income (super)multiplier — it has no permanent effect on growth. But it is not only because of analytical tractability needs that we rely on the supermultiplier approach to growth. In fact, as argued in Morlin et al. (2022), the apparently exogenous nature of growth in this model in reality reveals that the ultimate causes of growth, in particular of some autonomous expenditures, can only be fully understood by looking at social and political determinants. We further explore this point when interpreting the results of our model in section 4.

The second analytical step involves endogenizing the "natural growth rate of the economy". We build on Fazzari et al. (2020) to model the evolution of labor supply according to an exogenous demographic trend and to the current developments in the labor market. Therefore, a situation of low unemployment tends to attract workers from those out of the labor force and immigrant workers. This endogenous component of the evolution of labor supply counterbalances the impact of demand shocks on the labor market, with a stabilizing effect on the unemployment rate. In this way, under a persistently stable growth rate of labor demand, the unemployment rate converges to an equilibrium.[7]

Nevertheless, recent works that build on the supermultiplier and endogenize the labor supply still rely on the change in the employment rate (rather than the level of the unemployment rate) to determine workers' wage demands. Nah and Lavoie (2019), for example, develop a supermultiplier model combined with a conflict inflation process. The authors assume that workers' wage claims depend on the change in the employment rate and introduce an endogenous long-run adjustment of labor supply to demand. As a consequence, equilibrium distribution is not affected by any labor market variable in the long run, being solely determined by the exogenous parameters of workers and capitalists relative bargaining power (Nah and Lavoie, 2019, p. 435—436). Interestingly, the authors also emphasize the stabilizing role that autonomous demand has on a (medium-run) wage-led growth regime with endogenous distribution.[8]

[7] The potential mismatch between the natural growth rate and output growth rate, as determined by aggregate demand, is certainly not a new problem in long-term macroeconomics. Post-Keynesian economists have proposed many alternative solutions to the so-called Harrod's first problem (Harrod, 1939). One branch of the literature, following Kaldor (1978), proposes that labor supply adjusts endogenously to labor demand in the long term, within certain limits. The present paper builds on these contributions, in particular on the proposal of Fazzari et al. (2020). An alternative perspective proposes an adjustment of the growth of demand to the natural growth rate (Allain, 2019).

[8] "Under a specific assumption about the determinants of the endogenous share of profits which was similar to our own, Stockhammer (2004) had shown that there is no stable long-run equilibrium in any economy operating within a wage-led regime. By contrast, our model demonstrates that this defect can

To our knowledge, the only contributions that combine autonomous demand-led growth with an effect of the level of unemployment rate on wage inflation are Serrano (2019) and Morlin (2023). Morlin (2023) discusses the issue in an open economy context. The author derives a model of conflict inflation with an endogenous workers' claim determined by the unemployment rate, which, in turn, depends on the growth rate of the economy. However, the implications in terms of the Phillips curve slope and long-run growth are not fully appreciated. Serrano (2019) focuses on the distinction between mainstream and heterodox perspectives on the Phillips curve, and derives a long-run Phillips curve. The model proposed in the next section presents similarities with that contribution. While we endorse the existence of a conflict-augmented Phillips curve, as suggested by Serrano (2019), we move forward by providing an in-depth discussion on the outcomes for income distribution and the stability analysis of the model, and by discussing the political economy implications of different regimes of inflation and growth.

3. Conflict Inflation with Endogenous Workers' Claim

We model conflict inflation with endogenous workers' income claim. Hence, we explicitly introduce unemployment and the relation between the equilibrium unemployment rate and growth.

Let us start from the conflict inflation analysis. We consider the case of a closed economy producing one good with constant labor productivity.

3.1. Conflict Inflation model

We follow a baseline conflicting claims setup (Rowthorn, 1977; Lavoie, 2022). Conflicting claims over income distribution cause inflation, as workers bargain for higher money wages and capitalists pass-through labor costs into prices to preserve profits. We define an income claim in terms of a target for the wage share. Thus, workers target a value for the wage share. Capitalists target a lower value for the wage share, which expresses their target for the profit rate and the profit share. The conflict between the two sides causes inflation and shapes income distribution (Cassetti, 2002; Lavoie, 2022; Rowthorn, 1977).

Workers push for money wage increases to preserve their purchasing power after price increases. Therefore, the rate of growth of money wages ($\hat{w}$) depends on the inflation rate

be successfully addressed by considering the effects of an autonomously-growing and non-capacity creating component of effective demand. In this respect, autonomous expenditures [...] seem to play an important role, as they provide the needed medium-run or long-run stabilizing forces in a wage-led economy, and this has been shown with the help of a numerical simulation of the model"(Nah and Lavoie, 2019, p. 442).

(π), since changes in the cost of living affect wage negotiations, and often indexation rules are included in labor agreements. We assume this effect is contemporaneous and incomplete, so that α_1 (in equation 1) is positive but less than one.

Workers also aim to obtain real gains according to their aspiration gap. The workers' aspiration gap is defined as the difference between the workers' target for the wage share (ω_W) and the actual wage share (ω^t) (Rowthorn, 1977). The aspiration gap is thus the second determinant of money wage increases in equation 1. However, workers' ability to meet their target depends on their bargaining power. Hence, we introduce α_2 to account for the sensitivity of the rate of change in money wages to the workers' aspiration gap. In section 3.1.1, we model the workers' target as a function of the unemployment rate.

Equation 1 shows the evolution of money wages, according to these two effects.

$$\hat{w}^t = \alpha_1 \pi^t + \alpha_2(\omega_W - \omega^t) \tag{1}$$

Inflation follows equation 2, which expresses capitalists' pricing decisions. In line with the conflicting claims tradition, capitalists increase prices according to the difference between the actual wage share and capitalists' targeted wage share, that is, the capitalists' aspiration gap. Moreover, capitalists partially pass through labor cost increases into final prices (according to a coefficient λ_1, which is positive and smaller than one).

$$\pi^t = \lambda_1 \hat{w}^t + \lambda_2(\omega^t - \omega_K) \tag{2}$$

Since workers and capitalists have conflicting claims over income distribution (that is, $\omega_W > \omega_K$), wage and prices change, causing inflation and shifting distribtution.

3.1.1. Endogenous workers' claim

At this point we can endogenize workers' income claim.

Workers tend to obtain better wage agreements in periods of low unemployment rates. This effect can be modeled by making the workers' wage share target endogenous, being inversely related to the unemployment rate (Rowthorn, 1977). In this way, conflict inflation theory explains the empirical regularity found in the modified Phillips curve. Low unemployment is associated with high inflation stemming from strong workers and tight conflict. The unemployment rate appears as a determinant of the workers' target in many post-Keynesian short-term versions of the Phillips curve (Arestis and Sawyer, 2005; Rochon and Setterfield, 2012; Summa and Braga, 2020).

We can therefore define that the workers' target for the wage share depends on an autonomous component, expressing institutional and political factors (θ_0), and a second term that expresses the effect of the unemployment rate (u).

$$\omega_W = \theta_0 - \theta_1 u^t \tag{3}$$

The unemployment rate evolves according to the difference between the growth of the labor force (g_N) and the growth of the labor demand (g_L). We model the response of the labor market to demand in line with Fazzari et al. (2020). Hence, labor supply follows an exogenous demographic trend (β_0) with an added endogenous component (according to the coefficient β_1) that captures the response of the labor force to changes in unemployment (Fazzari et al., 2020). The endogenous component relates to entrance into and exit from the labor force and migratory movements in times of low unemployment. Therefore, the growth rate of the labor supply can be expressed by equation 4, where $\beta_0, \beta_1 > 0$.

$$g_N = \beta_0 - \beta_1 u_t \tag{4}$$

Labor demand grows according to the growth of aggregate demand. In line with the supermultiplier approach, output level is determined by the level of autonomous demand (Z) and by the supermultiplier (σ) effect.

$$Y = \sigma_t Z_t \tag{5}$$

The supermultiplier is determined by the propensity to consume (c) and the propensity to invest (h).

$$\sigma_t = \frac{1}{1 - c_t - h_t} \tag{6}$$

Since both propensities can vary over time, the value of the supermultiplier changes in time. The propensity to consume varies with changes in the wage share caused by the conflict inflation process. An increase in the wage share leads to a rise in the economy's average propensity to consume, as workers generally have a higher tendency to spend a greater portion of their income on consumption. We assume, for simplicity, a linear relationship in the form $c_t = \phi\omega_t$.

The propensity to invest, on the other hand, follows a flexible accelerator mechanism (Freitas and Serrano, 2015).[9] The propensity to invest (h), therefore, changes according to discrepancies between the actual (μ_t) and the normal (μ_n) degree of capacity utilization (see, e.g., Freitas and Serrano, 2015, equation 8, p. 266), as in equation 7.

[9]See Girardi and Pariboni (2020) for an empirical validation of the postulated positive effect of autonomous demand growth on the (non-residential business) investment share of the economy.

$$\dot{h}_t = h_t\gamma(\mu - \mu_n) \tag{7}$$

Considering the evolution of the propensities to consume and to invest, the growth rate of the economy, out of the steady state, is given by the expression below (derived in the mathematical appendix):

$$g_Y = g_Z + \sigma_t\phi\dot{\omega} + \sigma_t h_t\gamma(\mu - \mu_n) \tag{8}$$

Output growth rate determines the growth rate of labor demand, so that $g_L = g_Y$. The rate of change in the unemployment rate is given by the difference between the growth rates of labor supply and demand.

$$\hat{u} = \left(\frac{1-u_t}{u_t}\right)(g_N - g_L) \tag{9}$$

Therefore,

$$\hat{u} = \left(\frac{1-u_t}{u_t}\right)[\beta_0 - \beta_1 u_t - g_Z - \sigma_t\phi\dot{\omega} - \sigma_t h_t\gamma(\mu - \mu_n)] \tag{10}$$

Finally, the law of motion of capacity utilization (Freitas and Serrano, 2015, p. 10), under the assumption of a given capital-output ratio[10], is given by

$$\dot{\mu} = \mu\,[g_Y - g_K] \tag{11}$$

This can be rewritten as in equation 12, which differs from the one proposed in standard Sraffian supermultiplier models only inasmuch as we also account for the impact of a variable wage share on demand.

$$\dot{\mu} = \mu\left[g_Z + \sigma_t\phi\dot{\omega} + \sigma_t h_t\gamma(\mu_t - \mu_n) - \left(\frac{h_t}{v}\mu_t\right) + \delta\right] \tag{12}$$

3.1.2. Equilibrium

We have set up a model that combines conflict inflation and demand-led growth, following the supermultiplier approach. Growth and distribution become interconnected processes linked through the unemployment rate. The pace of growth influences the unemployment rate, which, in turn, affects distribution by weakening or enhancing workers' bargaining power.

We can summarize the dynamic system in four equations. The endogenous variables are the propensity to invest (as in equation 7), capacity utilization (12), the unemployment

[10] We assume no technical progress throughout the article.

rate (10), and the wage share (see subsection 6.4 of the Appendix). In this model, the inflation rate can be fully determined once we have established the equilibrium for the other variables. Therefore, the dynamics for inflation do not provide any additional information to the system. The model's equilibrium requires equilibrium in the two simultaneous processes. One the one hand, there is the growth and accelerator process; on the other, the relation between growth and unemployment, and conflict-inflation and the wage share.

The equilibrium between inflation and distribution resulting from the conflict inflation model implies an equilibrium wage share (with $\dot{\omega} = 0$), in correspondence to which the propensity to consume achieves the equilibrium. Under a persistent growth rate of autonomous expenditures (Freitas and Serrano, 2015), and in the absence of changes in distribution, the growth rate of the economy is determined by the growth rate of autonomous demand ($g_Y = g_Z$ in equation 8). The propensity to invest converges to its equilibrium value (see equation 13 below) as capacity utilization converges to normal capacity (see also 14).

$$h^* = \frac{v}{\mu_n}(g_Z + \delta) \tag{13}$$

$$\mu^* = \mu_n \tag{14}$$

In this case, we can also obtain the equilibrium unemployment rate and thus the equilibrium wage share. The equilibrium unemployment rate is therefore given by the difference between the exogenous growth of the labor force and the growth of autonomous demand divided by the endogenous adjustment of labor supply to labor demand:

$$u^* = \frac{\beta_0 - g_Z}{\beta_1} \tag{15}$$

With the equilibrium rate of unemployment, we can define the equilibrium of the conflict inflation model. From equations 1, 2, 3, 15 we obtain the following equilibrium wage share:

$$\omega^* = \frac{\alpha_2(1-\lambda_1)(\theta_0 - \theta_1 u^*) + \lambda_2(1-\alpha_1)\omega_K}{(1-\alpha_1)\lambda_2 + (1-\lambda_1)\alpha_2} \tag{16}$$

The equilibrium wage share is a weighted average between the distributive target of workers and capitalists – a typical result in the conflicting claims tradition. The equilibrium wage share increases with falls in the unemployment rate.

The inflation rate, in equilibrium, is given by equation 17. Whenever workers' and capitalists' income claims differ, the numerator of equation 17 is positive, so that the distributive conflict causes inflation. Higher indexation of wages (α_1), and faster adjustment of prices to labor cost increases (λ_1) lead to a higher equilibrium inflation.

$$\pi^* = \frac{\alpha_2\lambda_2(\theta_0 - \theta_1 u^* - \omega_K)}{(1-\alpha_1)\lambda_2 + (1-\lambda_1)\alpha_2} \tag{17}$$

In section 3.2, We further examine the implications of this result for inflation in terms of a Phillips curve.

3.1.3. Stability Condition

The equilibrium is locally stable as long as the condition in 18 is satisfied (derived in the Appendix).

$$\phi\omega^* + h^* + \gamma v < 1 \tag{18}$$

The condition is analogous to the stability condition of the original version of the Sraffian supermultiplier (Freitas and Serrano, 2015). Nevertheless, we now account for the effect of the wage share on the propensity to consume. Stability therefore requires that the "expanded" marginal propensity to spend is smaller than one. In our model, the "expanded" marginal propensity to spend includes the role of the equilibrium wage share, which determines the equilibrium propensity to consume.

3.2. Phillips curve

We can derive a persistent relation between inflation and unemployment from the results of the conflict inflation model. We can thus rewrite equation 17 as in equation 19, obtaining an inverse relation between inflation and unemployment. This expression can be interpreted as a long-term Phillips curve.

$$\pi^* = A - Bu^* \tag{19}$$

Where A defines the intercept,

$$A = \frac{\alpha_2\lambda_2(\theta_0 - \omega_K)}{(1-\alpha_1)\lambda_2 + (1-\lambda_1)\alpha_2} \tag{20}$$

and B defines the slope of the Phillips curve.

$$B = \frac{\theta_1}{(1-\alpha_1)\lambda_2 + (1-\lambda_1)\alpha_2} \tag{21}$$

The intercept, A, is positive whenever $\theta_0 - \omega_K > 0$. Note that θ_0 corresponds to the workers' target in the case of full employment, that is when $u = 0$. At this point, workers enjoy the maximum bargaining power in the labor market, which, therefore, causes the greatest degree of conflict (*i.e.*, the greatest divergence between workers' and capitalists' targets). The intercept A is therefore proportional to the conflict over distribution under full employment, depending on both workers' and capitalists' income claims. Hence, conflict inflation may be also triggered by an increase in the profit claim of capitalists, meaning a fall in their targeted wage share (ω_K). Increased market power resulting from the lifting of barriers to competition can boost capitalists' profit claims. Moreover, supply-side bottlenecks may create temporary market power, leading to price increases and higher profits (Weber and Wasner, 2023). In open economies, profit claims in tradable industries may arise from exchange rate devaluations or increases in international prices for tradable goods (Morlin, 2023). In any case, profit claims are only propagated into persistent inflation if a wage-price spiral takes place. Restrictive demand management cannot effectively prevent inflation caused by rising imported input prices and profit margins. However, such policies hinder workers' capacity to respond to these shocks, thereby limiting the propagation of inflation at the cost of a decline in the wage share.

In turn, the slope of the Phillips curve varies with the parameter θ_1. The Phillips curve will be more or less steep according to the component of bargaining power derived from the labor market. If $\theta_1 = 0$, so that unemployment does not affect workers' claim, we will have a completely horizontal Phillips curve.

An exogenous decrease in workers' bargaining power that implies a reduced capacity to convert lower unemployment into higher wage claims, that is, a lower θ_1, causes a flattening of the Phillips curve, a finding consistent with empirical evidence on periods of lower worker bargaining power and lower unionization rates.[11] This is, for example, the argument of Ratner and Sim (2022). According to the authors, labor market policies in the U.S. have weakened workers' bargaining power to such a great extent that it is not necessary to cause high unemployment in order to discipline wage claims and reduce conflict inflation. This finding is also consistent with the interpretations of post-Keynesian scholars (see, for instance, Summa and Braga, 2020, p. 100; Setterfield and Blecker, 2022). In particular cases, more coordinated systems of wage bargaining can explain a lower θ_1 when there is cooperation between unions and policy targets as full employment or exports growth (Baccaro and Pontusson, 2016).

On the other hand, a lower equilibrium inflation rate also requires a lower intercept. This can result from a less tight distributive conflict. One possible cause of of this may be a lower institutional bargaining power of workers (θ_0).

Note, finally, that when there is perfect wage indexation and complete pass through

[11] A flatter Phillips curve implies smaller changes in the inflation rate after changes in unemployment.

of wage increases into final prices, the Phillips curve becomes vertical in the equilibrium unemployment determined in the labor market. In other words, in the extreme scenario in which $\alpha = 1$ and $\lambda = 1$, the inflation rate is indefinite.[12] The unemployment rate, however, is still determined by labor supply and demand, at a level independent from the Phillips curve.

4. *The political economy of autonomous demand*

Building on the model introduced in the previous section, we can now make explicit some underlying relations. By substituting equation 15 in equation 16, we can obtain:

$$\omega^* = \frac{\beta_1\Phi_1 + \Phi_2(g_Z - \beta_0)}{\beta_1\Phi_3} \tag{22}$$

Where:

$$\Phi_1 = \alpha_2(1-\lambda_1)\theta_0 + (1-\alpha_1)\lambda_2\omega_K \tag{23}$$

$$\Phi_2 = \alpha_2(1-\lambda_1)\theta_1 \tag{24}$$

$$\Phi_3 = (1-\alpha_1)\lambda_2 + (1-\lambda_1)\alpha_2 \tag{25}$$

Note that $\frac{d\omega^*}{d\beta_0} < 0$, $\frac{d\omega^*}{d\beta_1} < 0$, and $\frac{d\omega^*}{dg_Z} > 0$.

As can be easily seen, a more sustained exogenous trend for the labor force (a higher β_0) and a higher sensitivity of labor force growth to unemployment (a higher β_1) are conducive to a lower wage share. This is not surprising. A higher β_0 increases, ceteris paribus, the unemployment rate; a higher β_1, on the other hand, eases labor supply shortages when unemployment is low. We can also notice that a higher rate of growth of the autonomous components of demand leads to a higher wage share, so that equilibrium income distribution is affected by autonomous demand growth.

Governments and central banks have powerful influence over the dynamics of autonomous

[12] As argued by Summa and Braga (2020, p. 93), the vertical Phillips curve is "a special case of a more general conflict-augmented Phillips curve, [ocurring] when workers' bargaining power is strong enough to guarantee the full incorporation of expected inflation into wages". The key reason to reject the accelerationist Phillips curve, therefore, is workers' usual inability to fully include expected inflation into wage agreements, rather than the update of inflation expectations due to past or expected shocks. In our model, we abstract from the formation of expectations, introducing the past inflation as a determinant of workers' wage claims. The accelerationist case emerges when past inflation is completely included in wage increases and past wage increases are completely included in price increases.

demand through fiscal[13] and monetary policy. Thus, equation 22 shows what is at stake when "the doctrine of sound finance" (Kalecki, 1943, p. 325), or more vividly "the myth of sound finance" (ibid., p. 326), is invoked. In fact, the business opposition to full employment policies could lead to a long-term "political trend" characterized by stagnation policies, with governments and central banks prioritizing "inflation and the public debt" over employment (Steindl, 1979, p. 119). A slower pace for government spending can be beneficial to the profit share in income, while expansionary fiscal policies – by reducing unemployment and increasing workers' bargaining power – might induce a redistribution of income in favor of workers. Likewise, central banks can direct monetary policy towards tackling inflation in periods of tight labor market, often through a deliberate slowdown of economic activity. Interest rate hikes reduce credit demand from households (Deleidi, 2018), shrinking demand and employment and contributing to moderating the wage dynamics (Di Bucchianico and Lofaro, 2023). To explicitly relate this argument to the analytical framework we adopt, it can be said that monetary policy affects autonomous components of demand such as household consumption financed out of credit and residential investment, which have been proved to play a significant part in explaining business cycles and long-run growth (Pérez-Montiel and Pariboni, 2022; Fiebiger and Lavoie, 2019).[14]

The domain of macroeconomic policy is, then, yet another dimension of the social conflict over the division of the social product between classes. Our model reveals this dimension in a relation between distribution and growth, as in equation 22. This result also helps to explain the rationale behind the apparent exogeneity of the growth process in autonomous demand-led models, which have been criticized by Blecker and Setterfield on the basis that "Sraffian-inspired developments in supermultiplier analysis have prompted a sudden, late, and undesirable turn towards exogenous growth theory in heterodox macrodynamics" (Blecker and Setterfield, 2019, p. 366). The analytical strategy we adopt reflects the view that the investigation of the ultimate causes of growth does not belong exclusively to the sphere of economic modeling intricacies. Rather, they have to be explored by looking also at the political and social determinants, and implications, of (autonomous demand) growth (Morlin et al., 2022), as it has been vividly emphasized by the recent research stream on the political economy (and the politics) of growth models (Baccaro and Pontusson, 2016, 2022).

The simple mechanics described by equations 22 – 25 allow for some analytical exer-

[13]For a detailed discussion, the reader can refer to Allain (2015), Hein (2018), Freitas and Christianes (2020), Morlin (2022).

[14]Monetary policy can influence autonomous consumption through changes in house prices as well (Góes, 2021). Finally, it is noteworthy that monetary policy directly affects income distribution, by safeguarding financial incomes and increasing the opportunity cost of capital (Pivetti, 1991).

cises. For example, we can derive a theoretical, politically determined, upper bound to the growth rate of autonomous demand ($\bar{g}_Z$), as entailed by the maximum wage share ($\bar{\omega}^*$) that capitalists are willing to tolerate:

$$\bar{g}_Z = \beta_0 + \frac{\beta_1 \Phi_3 \bar{\omega}^* - \beta_1 \Phi_1}{\Phi_2} \tag{26}$$

Note that the lower the sensitivity of workers' wage claims to unemployment (θ_1 in equation 3), the lower is Φ_2 – as defined in equation 24 –, and thus the greater is the growth rate of autonomous demand compatible with a given wage share:[15] if workers' capacity to reap the benefits of reductions in unemployment is reduced, a looser constraint on growth ensues.

We can also think of a maximum unemployment rate the society can endure without endangering social order or engendering public unrest. By resorting to equation 15 we can establish a relation between the maximum unemployment rate ($\bar{\bar{u}}$) and the minimum growth rate of autonomous demand compatible with it:

$$\bar{\bar{g}}_Z = \beta_0 - \beta_1 \bar{\bar{u}} \tag{27}$$

This political constraint establishes a minimum growth rate for autonomous demand in the long run, so that it keeps an acceptable situation in the labor market, avoiding a social crisis. In fact, Fazzari, Ferri, Greenberg, and Variato (2013) stressed that the growth rate of autonomous expenditures can provide a floor for the evolution of unemployment.

To sum up, social and political factors are the ultimate determinants of autonomous demand growth rate (Morlin et al., 2022), which, then, becomes the object of political conflict. This political struggle involves economic policy decisions and the ideational dispute underlying economic policy. Blyth (2013) highlighted the resilience of austerity policies, even though they have failed to deliver on their promised outcomes in terms of growth and debt stability.[16] Rather, the economic failure of austerity policies mirrors its success in weakening workers, discouraging strikes, and dampening wages (Mattei, 2022). As we have seen, the political constraint on autonomous demand growth is less restrictive the weaker labor is, due to its reduced ability to convert a tight labor market into a higher wage share. On the other hand, the more organized and combative the labor movement is, the more passionate the

[15] A lower θ_1 reduces Φ_2 in equation 24. A similar reasoning applies to a lower θ_0 – the term describing the exogenous component in the wage claims equation (eq. 3) – which reduces Φ_1 and hence increases $\bar{g}_Z$.

[16] A standard criterion to assess the effectiveness of a certain fiscal policy is its impact on the health and sustainability of public finances. Also in this respect, however, fiscal austerity does not fare well, as the literature on the negative effects of fiscal consolidations has shown (see, e.g., Fatás and Summers, 2018; Fatás, 2019; Gechert, Horn, and Paetz, 2019).

capitalists will be about tight monetary policy, fiscal discipline, and "sound finance".

5. Conclusion

Income distribution is inherently conflictual, as each social class strives to increase its share of income at the expense of others. The tension generated by this conflict influences the price dynamics, revealing the contentious nature of inflation. Unemployment plays a crucial role in regulating the dispute between workers and business owners over income distribution. When there are more unemployed workers, the power dynamic shifts in favor of employers and helps keep workers' wage demands in check, which can help control inflation. This is the central tenet of conflict inflation theories, and it also represents the starting point of our article.

We built an autonomous demand-led growth model with endogenous income distribution according to a conflict inflation process. In doing so, we contribute to demand-led growth theory by integrating growth, inflation, and distribution, with the unemployment rate as the key regulator of workers' bargaining power. We found an inverse relation between the unemployment rate and inflation, in line with the original, old-school Phillips curve, and extend it to the long run, when the capital stock and the labor force can change. Weak labor can explain the flattening of the Phillips curve in this model, making faster growth and lower unemployment compatible with low (conflict) inflation.

The model also reveals an inverse relation between the growth rate of autonomous demand and the unemployment rate. As a consequence, there is also a direct relation between the growth rate of autonomous demand and the wage share. The last conclusion opens the door to an investigation of the political economy of autonomous demand, showing that macroeconomic policy is yet another dimension of the conflict between classes over the division of the social product. Indeed, fiscal and monetary policy can be particularly effective tools to tilt the balance of power against workers, as demonstrated, for example, by decades of fiscal austerity in Europe. Since macroeconomic policy crucially influences the growth of autonomous demand, our results contribute to the research agenda on the political economy of growth and stagnation (Baccaro and Pontusson, 2016).

The model can also shed light on a peculiar type of conflict that contributes to inflation. This occurs when capitalists exploit their market power to raise prices, resulting in higher profit margins that exceed their costs. In line with current discussions on the 'sellers' inflation' (Weber and Wasner, 2023), we show that demand management cannot prevent inflation stemming from imported input prices and profit margins. However, these policies undermine workers' ability to react to such shocks, containing the propagation of inflation at the cost of a persistent decrease in the wage share.

Acknowledgements

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6. Analytical appendix

6.1. Output and Growth

Output and growth are determined as in the Sraffian supermultiplier (Serrano, 1995). The level of output is thus determined according to the level of autonomous demand (Z) and the supermultiplier. We assume a closed economy setup. The supermultiplier therefore depends on the propensity to consume (c) and the propensity to invest (h).

Let's call the supermultiplier $\sigma_t = \frac{1}{1-c_t-h_t}$. Therefore:

$$Y_t = \sigma_t Z_t \tag{28}$$

Where $c_t = f(\omega)$, with $dc/d\omega > 0$. In other words, the propensity to consume is increasing in the wage share. We assume, for simplicity, a linear relationship in the form:

$$c = \phi\omega \tag{29}$$

Hence, the propensity to consume changes in proportion to changes in the wage share, as follows: $\dot{c} = \phi\dot{\omega}$.

Therefore, the propensity to consume is not constant in our model, since the conflicting claims process can change income distribution and, accordingly, the weight attributed to capitalists' and workers' propensities in the determination of the economy's average propensity to consume. As usual in the supermultiplier literature, neither the propensity to invest is a given parameter, but is determined endogenously within the model. The propensity to invest (h) changes according to discrepancies between the actual (μ_t) and the normal (μ_n) degree of capacity utilization (see, e.g., Freitas and Serrano, 2015, equation 8, p. 266), as in equation 31.

We can derive output growth rate from equation 30, where output growth rate is expressed as $g_Y = \frac{\dot{Y}}{Y}$; and the growth rate of autonomous demand as $g_Z = \frac{\dot{Z}}{Z}$.

$$g_Y = g_Z + \sigma_t(\dot{c}_t + \dot{h}_t) \tag{30}$$

Therefore, we can write:

$$g_Y = g_Z + \sigma_t\dot{c}_t + \sigma_t\dot{h}_t$$

From our previous definitions of the dynamics of the propensities to consume and to invest we have the two equations below:

$$\dot{h}_t = h_t \gamma(\mu - \mu_n) \tag{31}$$

$$\dot{c} = \phi \dot{\omega} \tag{32}$$

Finally, we obtain:

$$g_Y = g_Z + \sigma_t \phi \dot{\omega} + \sigma_t h_t \gamma(\mu - \mu_n) \tag{33}$$

The dynamics of the supermultiplier growth model can be summarized by the evolution of the propensity to invest and changes in capacity utilization (Freitas and Serrano, 2015, p. 10). The dynamic behavior of capacity utilization is given by the difference between the growth rate of demand and the growth rate of the capital stock ($\dot{\mu} = \mu(g_Y - g_K)$). In our model, this is represent in equation 34, which differs from Freitas and Serrano's (2015, p. 10) formulation only because we also consider the impact of a variable wage share on the growth of demand.

$$\dot{\mu} = \mu \left[g_Z + \sigma_t \phi \dot{\omega} + \sigma_t h_t \gamma(\mu_t - \mu_n) - \left(\frac{h_t}{v} \mu_t \right) + \delta \right] \tag{34}$$

6.2. *Unemployment*

Unemployment rate is given by the difference between the total labor force and total employment (L) divided by the labor force (N).

$$u = 1 - \frac{L}{N} \tag{35}$$

Assuming a constant labor productivity, employment changes according to the demand for labor. Therefore, the growth of labor demand follows output growth.

$$g_L = g_Y \tag{36}$$

In turn, unemployment depends also on the labor force. By taking logs and differentiating equation 35, we obtain:

$$\hat{u} = \left(\frac{1 - u_t}{u_t} \right) (g_N - g_L) \tag{37}$$

Where g_N stands for the growth rate of the labor force, which follows an exogenous demographic trend plus an endogenous component (β_0) adjusting the labor force to unemployment (according to the coefficient β_1) (Fazzari et al., 2020).

$$g_N = \beta_0 - \beta_1 u_t \tag{38}$$

Where $\beta_0, \beta_1 > 0$.

By combining equations 33, 36, 37, 38, we obtain the rate of change in unemployment:

$$\hat{u} = \left(\frac{1 - u_t}{u_t}\right) [\beta_0 - \beta_1 u_t - g_Z - \sigma_t \phi \dot{\omega} - \sigma_t h_t \gamma(\mu - \mu_n)] \tag{39}$$

Equilibrium unemployment emerges when growth rate and distribution achieve equilibrium according to the supermultiplier mechanism and the conflicting claims process. In the absence of changes in distribution (and thus in the propensity to consume), in the growth rate of autonomous demand, and as capacity utilization converges to normal capacity, the employment rate stabilizes ($\hat{u} = 0$). The long run equilibrium unemployment rate is given by:

$$u^* = \frac{\beta_0 - g_Z}{\beta_1} \tag{40}$$

6.3. *Change in the wage share*

From the change in money wages with an endogenous target for the wage share, we have the following expression:

$$\hat{w}^t = \alpha_1 \pi^t + \alpha_2(\theta_0 - \theta_1 u^t - \omega^t) \tag{41}$$

In its turn, prices change according to the equation below.

$$\pi^t = \lambda_1 \hat{w}^t + \lambda_2(\omega^t - \omega_K) \tag{42}$$

Since we assume a constant labor productivity, the dynamics of the wage share follows the dynamics of the real wage. Therefore, the wage share varies according to the difference between increases in the money wages and the inflation rate ($\hat{\omega}_t = \hat{w}_t - \pi_t$). From equations 41 and 42, we obtain the following dynamics for the wage share:

$$\hat{\omega} = \alpha_1 \pi_t - \lambda_1 \hat{w}^t + \lambda_2 \omega_K + \alpha_2(\theta_0 - \theta_1 u^t) - (\lambda_2 + \alpha_2)\omega_t \tag{43}$$

By further substituting the expressions for π and w in equation 43, and doing a few operations, we get:

$$\hat{\omega} = \frac{(1 - \alpha_1)\lambda_2 \omega_K + \alpha_2(1 - \lambda_1)(\theta_0 - \theta_1 u^t) - [(1 - \alpha_1)\lambda_2 + \alpha_2(1 - \lambda_1)]\omega_t}{1 - \alpha_1 \lambda_1} \tag{44}$$

6.4. *Equilibrium*

As discussed in depth in the text, the model's equilibrium requires equilibrium in the two simultaneous processes. One the one hand, there is the growth and accelerator process; on the other, the relation between growth, unemployment, and the distributive conflict and wage-setting process.

We can summarize the dynamic system in four equations. The endogenous variables are the propensity to invest, capacity utilization, the unemployment rate, and the wage share.

$$\hat{h} = \gamma(\mu_t - \mu_n) \tag{45}$$

$$\hat{\mu} = g_Z + \sigma_t \phi \dot{\omega}_t + \sigma_t h_t \gamma(\mu_t - \mu_n) - \left(\frac{h_t \mu_t}{v}\right) + \delta \tag{46}$$

$$\hat{u} = \left(\frac{1 - u_t}{u_t}\right) [\beta_0 - \beta_1 u_t - g_Z - \sigma_t \phi \dot{\omega}_t - \sigma_t h_t \gamma(\mu - \mu_n)] \tag{47}$$

$$\hat{\omega} = \frac{(1 - \alpha_1)\lambda_2 \omega_K + \alpha_2(1 - \lambda_1)(\theta_0 - \theta_1 u^t) - [(1 - \alpha_1)\lambda_2 + \alpha_2(1 - \lambda_1)]\omega_t}{1 - \alpha_1 \lambda_1} \tag{48}$$

Equilibrium is described as follows, being denoted by a superscript *. When the wage share stabilizes in the equilibrium of the conflict inflation process, and assuming a persistent growth rate of autonomous demand, output growth equals the growth rate of autonomous demand. In this process, the propensity to invest stabilizes at the equilibrium value (see 49), as capacity utilization converges to normal capacity (see 50).

$$h^* = \frac{v}{\mu_n}(g_Z + \delta) \tag{49}$$

$$\mu^* = \mu_n \tag{50}$$

$$u^* = \frac{\beta_0 - g_Z}{\beta_1} \tag{51}$$

$$\omega^* = \frac{(1 - \alpha_1)\lambda_2 \omega_K + \alpha_2(1 - \lambda_1)(\theta_0 - \theta_1 u^*)}{(1 - \alpha_1)\lambda_2 + \alpha_2(1 - \lambda_1)} \tag{52}$$

6.5. *Local Stability analysis of conflict inflation with endogenous workers' claim in a supermultiplier growth model*

In this appendix, we analyze the stability of the dynamic system formed by equations 45, 46, 47, 48. Local stability is analyzed in the vicinity to the equilibrium described by equations 49, 50, 51, 52.

The Jacobian matrix evaluated in the equilibrium is defined by the expression below.

$$\boldsymbol{J^*} = \begin{bmatrix} \left[\frac{d\hat{h}}{dh}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{h}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{h}}{du}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{h}}{d\omega}\right]_{h^*,\mu^*,u^*,\omega^*} \\ \left[\frac{d\hat{\mu}}{dh}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{\mu}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{\mu}}{du}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{\mu}}{d\omega}\right]_{h^*,\mu^*,u^*,\omega^*} \\ \left[\frac{d\hat{u}}{dh}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{u}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{u}}{du}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{u}}{d\omega}\right]_{h^*,\mu^*,u^*,\omega^*} \\ \left[\frac{d\hat{\omega}}{dh}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{\omega}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{\omega}}{du}\right]_{h^*,\mu^*,u^*,\omega^*} & \left[\frac{d\hat{\omega}}{d\omega}\right]_{h^*,\mu^*,u^*,\omega^*} \end{bmatrix} \tag{53}$$

We must now compute the partial derivatives and evaluate them at the equilibrium values.

The partial derivatives of the first line of the Jacobian matrix follow below.

$$\left[\frac{d\hat{h}}{dh}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

$$\left[\frac{d\hat{h}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} = \gamma$$

$$\left[\frac{d\hat{h}}{du}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

$$\left[\frac{d\hat{h}}{d\omega}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

The computed partial derivatives of the second line of the Jacobian matrix follow below.

$$\left[\frac{d\hat{\mu}}{dh}\right]_{h^*,\mu^*,u^*,\omega^*} = \frac{-\mu_n}{v}$$

$$\left[\frac{d\hat{\mu}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} = \sigma^* h^* \gamma - \frac{h^*}{v}$$

Therefore,

$$\left[\frac{d\hat{\mu}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} = \frac{(g_Z + \delta)}{\mu_n}(\sigma^* \gamma v - 1)$$

$$\left[\frac{d\hat{\mu}}{du}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

$$\left[\frac{d\hat{\mu}}{d\omega}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

In the third line of the Jacobian matrix, we have the following elements:

$$\left[\frac{d\hat{u}}{dh}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

$$\left[\frac{d\hat{u}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} = -\left(\frac{1-u^*}{u^*}\right)\sigma^*\gamma h^*$$

We can rewrite this partial derivative as follows:

$$\left[\frac{d\hat{u}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} = -\left(\frac{1-u^*}{u^*}\right)\sigma^*\gamma\frac{v}{\mu_n}(g_Z+\delta)$$

$$\left[\frac{d\hat{u}}{du}\right]_{h^*,\mu^*,u^*,\omega^*} = -\beta_1\left(\frac{1-u^*}{u^*}\right)$$

$$\left[\frac{d\hat{u}}{d\omega}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

Finally, the elements of the fourth line of the Jacobian matrix are computed below.

$$\left[\frac{d\hat{\omega}}{dh}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

$$\left[\frac{d\hat{\omega}}{d\mu}\right]_{h^*,\mu^*,u^*,\omega^*} = 0$$

$$\left[\frac{d\hat{\omega}}{du}\right]_{h^*,\mu^*,u^*,\omega^*} = -\alpha_2(1-\lambda_1)\theta_1$$

$$\left[\frac{d\hat{\omega}}{d\omega}\right]_{h^*,\mu^*,u^*,\omega^*} = -[(1-\alpha_1)\lambda_2+\alpha_2(1-\lambda_1)]$$

Once we computed each element of the Jacobian matrix, we can now evaluate the roots of the characteristic polynomial.

The Jacobian matrix is thus given by:

$$
\boldsymbol{J^*} = \begin{bmatrix} 0 & \gamma & 0 & 0 \\ -\frac{\mu_n}{v} & \frac{(g_Z+\delta)}{\mu_n}(\sigma^*\gamma v - 1) & 0 & 0 \\ 0 & -\left(\frac{1-u^*}{u^*}\right)\sigma^*\gamma\frac{v}{\mu_n}(g_Z+\delta) & -\beta_1\left(\frac{1-u^*}{u^*}\right) & 0 \\ 0 & 0 & -\alpha_2(1-\lambda_1)\theta_1 & -[(1-\alpha_1)\lambda_2+\alpha_2(1-\lambda_1)] \end{bmatrix} \tag{54}
$$

Therefore, the characteristic polynomial, which will give us the eigenvalues of the matrix $\boldsymbol{J^*}$, is expressed by the equation below:

$$
\left[-\beta_1\left(\frac{1-u^*}{u^*}\right) - x\right]\{-[(1-\alpha_1)\lambda_2+\alpha_2(1-\lambda_1)]-x\}\left[x^2 - \frac{(g_Z+\delta)}{\mu_n}(\sigma^*\gamma v-1)x + \gamma\left(\frac{\mu_n}{v}\right)\right] \tag{55}
$$

The roots of the characteristic polynomial trivially give us two eigenvalues of $\boldsymbol{J^*}$ (x_1 and x_2 below):

$$
x_1 = -\beta_1\left(\frac{1-u^*}{u^*}\right) \tag{56}
$$

$$
x_2 = -[(1-\alpha_1)\lambda_2+\alpha_2(1-\lambda_1)] \tag{57}
$$

The roots x_1 and x_2 are negative.

The other two eigenvalues of $\boldsymbol{J^*}$ come from the solution of the polynomial below:

$$
x^2 - \frac{(g_Z+\delta)}{\mu_n}(\sigma^*\gamma v-1)x + \gamma\left(\frac{\mu_n}{v}\right) \tag{58}
$$

Since the term $\gamma\left(\frac{\mu_n}{v}\right)$ is always positive, the remaining two roots of the characteristic polynomial are negative as long as the second term is positive, that is, $\left[-\frac{(g_Z+\delta)}{\mu_n}(\sigma^*\gamma v-1)\right] > 0$. In other words, the remaining roots of the characteristic polynomial are negative if the condition below holds:

$$
\sigma^*\gamma v - 1 < 0 \tag{59}
$$

Since $\sigma^* = 1/(1-\phi\omega^*-h^*)$, we can rewrite the condition as follows below.

$$
\phi\omega^* + h^* + \gamma v < 1 \tag{60}
$$

This condition is analogous to the stability condition of the original version of the Sraffian supermultiplier (Freitas and Serrano, 2015), but we now account for the effect of the wage share on the propensity to consume. Stability, therefore, requires that the "expanded" marginal propensity to spend is smaller than one. In our model, the "expanded" marginal propensity to spend includes the equilibrium wage share, which determines the equilibrium propensity to consume.