Conflict inflation and the Phillips curve: rethinking their microfoundations in an agent-based model

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Abstract

This article investigates the inflation dynamics in an agent-based model that incorporates numerous microfoundations concerning price and wage setting decisions and labor market framework. The first part discusses the compatibility of the post-Keynesian conflicting-claims inflation model results from a microfounded, bottom-up model. The second part explores the implications of different hypotheses concerning individual behavior and labor market frameworks for the shape of the Phillips curve.

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JEL Classification: C63 , D3 , E11 , E12 , E31.

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1 Introduction

In the post-Keynesian perspective, inflation is considered to be the outcome of the distributive conflict. Indeed, capitalists and workers may have inconsistent claims over the income generated in the production process, and these claims are made consistent in an *ex-post* manner through inflation.

Since the work of Rowthorn (1977) and Dutt (1987) outlying the basic elements of the conflicting-claims inflation approach, many authors have

expanded the model and analyzed its key implications. One strand of this literature has provided a post-Keynesian explanation for the Phillips curve, which can be considered consistent with conflicting-claims inflation if it is assumed, for instance, that workers' bargaining power or their desired wages increase with employment rates. Recently, Hein and Häusler (2024) analyzed this literature, showing that different treatments of key assumptions lead to different versions of the Phillips curve and, in some cases, the emergence of a NAIRU.

While numerous authors have explored the Phillips curve in light of the conflicting-claims inflation model, most of the literature so far uses aggregate models. This means that these models do not explicitly consider what type of microfoundations would generate the macroeconomic results captured by the aggregate models. Motivated by this gap in the literature, this paper aims to investigate whether the main results obtained in aggregate conflicting-claims inflation models hold if one explicitly considers labor market interactions where individual behavior of firms and workers is microfounded. Moreover, we investigate under which conditions the NAIRU emerges as an emergent property of the model and compare these conditions with the existing literature.

Our analysis is undertaken in an agent-based model including heterogeneous firms and workers and a labor market with local interactions. The model is based on a previous existing model (Rolim et al., 2023, 2024), which has been revised to consider in more detail individual claims in wage negotiations. In contrast with the mainstream literature, by using an agent-based model we consider microfoundations that are consistent with observed behavior of individual firms (rational expectations or maximizing agents are not assumed) and generate heterogeneity among firms and workers (no representative agent). This latter aspect also provides a more nuanced relationship between inflation and unemployment relative to the existing post-Keynesian aggregate models.

The main hypothesis guiding this article is that the properties from the aggregate conflicting-claims inflation model are fully compatible with realistic microfoundations. Moreover, two main hypotheses motivate the investigation of the Phillips curve in the context of an agent-based model. The first one is that workers' heterogeneity has implications to the nominal wage determination and the degree of wage indexation to past inflation, especially through the influence of unemployed workers when there is no collective bargaining. The second one is that competition among firms may affect the degree of price indexation to wages, with implications for the Phillips curve.

This article contributes to the literature in different dimensions. From the point of view of the consolidated post-Keynesian literature on the topic, it strengthens the robustness of the conflicting-claims inflation view by showing that it is fully compatible with realistic microfoundations. In comparison with aggregate macroeconomic models, agent-based models are flexible enough to capture different dimensions of the distributive conflict that are not easily modeled in analytical model, thus explicitly capturing disagreements at the nominal wage negotiation level and reproducing the inherent asymmetry in the definition of real wages (Rolim et al., 2023). Moreover, agent-based models are

well suited for dealing with non-linearities that can emerge in individual behavior (e.g., downward wage rigidity) and the heterogeneity of individual behavior depending on specific circumstances (e.g. employment status). By discussing a framework for generating positive inflation levels, our results also contribute to the more specific agent-based macroeconomic modeling literature, which in many cases struggles with (unrealistic) deflationary dynamics. While other articles have explored the topic of inflation and the Phillips curve through agent-based models (Aoyama et al., 2022; Caiani et al., 2016; Guilmi and Fujiwara, 2022; Fagiolo et al., 2004; Riccetti et al., 2015; Rolim et al., 2024, among others), there has been little explicit connection with the post-Keynesian literature. Finally, the article contributes to discussions concerning the nature of the Phillips curve by exploring how agents' heterogeneity alters some of the possible conclusions from the heterodox and mainstream literatures.

The remaining of the article is organized as follows. Section 2 discusses the main properties of the model. Section 3 presents the simulation results. Finally, concluding remarks are discussed in Section 4.

2 Main features of the model

The model is a revised version of Rolim et al. (2023, 2024), which is presented in detail in the Appendix A. Its structure and the interactions between the agents are represented in Figure 1. The economy comprises a monopolist capital goods firm, heterogeneous consumption goods firms, a monopolist bank, heterogeneous households divided into three classes (direct workers, indirect workers, and capitalists), and a public sector represented by a government and a central bank. Due to the theoretical nature of this work, we do not assume that the central bank follows the inflation targeting regime or any other type of monetary policy rule.[1]

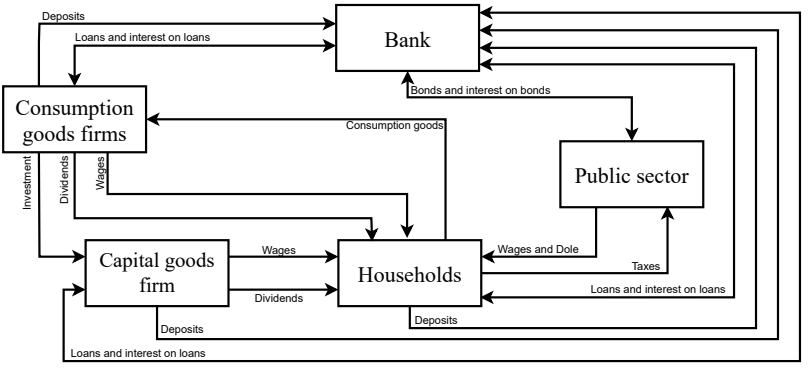


Fig. 1: Model structure

Note: Arrows point from paying sector to receiver sector. Source: Rolim et al. (2024).

[1] Monetary policy rules are discussed in detail in Rolim et al. (2024).

The main features of the model that are relevant for the discussion put forward here concern the microfoundations guiding individual wage and price decisions and the labor market framework. As discussed below, the microfoundations incorporated into the model draw upon empirical literature as much as possible.

2.1 Firms' price and wage adjustments

Considering a sample of European firms, Bertola et al. (2012) find that firms' responses to wage shocks consist mostly of cutting other costs (62.14%), increasing prices (61.84%), and reducing profit margins (54.26%). Their findings indicate that increasing prices is more likely if competition is not strong and collective agreements (at higher level) are strong.

Druant et al. (2012) find that inflation is the most important driver of frequent wage adjustments. Their study suggests that, among the European firms in their sample, almost one third of firms adopt an internal rule that adjusts wages to inflation. In some cases this occurs automatically, while in others there is no formal rule but inflation is considered in base wage adjustments. For the majority of firms, past inflation is considered rather than expected inflation.

Based on this evidence, it is assumed that:

1. Increases in unit labor costs may or may not be passed on to prices. This depends on the sensitivity of the markup to changes in unit costs (parameter $\nu_3 \geq 0$ in Equation A.9). Two cases are assumed: i) complete pass-through (markup only depends on competitive conditions among firms); ii) incomplete pass-through (markup also depends on the evolution of nominal unit labor costs).
2. Firms' desired wage may or may not be indexed to inflation. This is captured by the parameter $\kappa \geq 0$ in Equation A.12. Two cases are assumed: i) full indexation of previous inflation rate; and ii) no indexation.

2.2 Workers' desired wages and on-the-job search

Blanchflower (1991) finds that probability of job loss and a personal unemployment history tend to depress wages. This suggests that there is some linkage between how workers perceive the labor market situation and their wage expectations or demand.

There is also evidence that workers engage in on-the-job search. Hall and Krueger (2012) find that employers in the United States hire a substantial fraction of their employees away from other employers. Similar evidence is provided by Christensen et al. (2005), who also find that search effort declines with the wage level.

Based on this evidence, it is assumed that:

1. Employed workers always desire a real wage growth given by $\gamma > 0$. This means that there is complete indexation of past inflation to their desired wages, as shown in Equation A.10.
2. Employed workers may look for a new job in case their desired wage is above the wage offered by their current employer. The probability of looking for a new job is determined by a parameter $s > 0$ multiplied by the difference between the wage offered by the current employer and the average wage in the market divided by the latter. They accept any offer above their current wage.
3. Unemployed workers index their last wage to the accumulated inflation rate since their last employment, but slowly revise their desired nominal wages downwards depending on the number of periods during which they have been unemployed since their last employment. For every period of unemployment, the wage is reduced by $\gamma > 0$, as reported in Equation A.10.
4. Employed and unemployed workers do not incorporate negative inflation rates to their desired wages.
5. Workers' reservation wage is the unemployment dole offered by the government.

2.3 Labor market and wage bargaining

Bhuller et al. (2022) show that a fully decentralized and individualized wage setting process is rare in practice. Instead, the majority of workers in European countries are covered by collective bargaining. This is the case despite of low and declining unionization rates.[2] Nonetheless, there is a lot of variety among countries with respect to their degree of horizontal coordination (bargaining level, from local to centralized) and horizontal coordination (workers type). Bhuller et al. (2022) consider that changes of the type of bargaining through time suggest as shift towards a decentralization of collective bargaining, rather than a shift towards individual bargaining.

Evidence provided by Blanchflower (1991) suggests that unemployment may be a factor influencing the bargaining process. However, since they find that higher unemployment rates are associated with lower wages, one cannot dismiss other reasons for this correlation. The author argues that *"unemployment - works through a variety of channels - to depress wages"* (Blanchflower, 1991, p. 498), and the bargaining power of workers may be one of them.

There is also evidence that the collectively bargained wages apply to newly hired employees. In a survey with European firms, Galuscak et al. (2012) find that internal pay structures are more important than external factors, such as labor market conditions. Similar evidence is provided by Bewley (2007) for the United States. This seems to be the case due to internal equity and fairness concerns, in addition to labor regulation. Nonetheless, individual bargaining during hiring may be relevant in the case of the United States, in particular for more-educated workers (Hall and Krueger, 2012).

[2] In the case of the United States and United Kingdom, however, collective bargaining coverage has been decreasing and is below 15% and 30% respectively (Bhuller et al., 2022).

Numerous authors find evidence in favor of downward nominal wage rigidity, suggesting that nominal wage cuts for incumbent workers are extremely rare (Babecký et al., 2010; Dickens et al., 2007; Lebow et al., 2003). As argued by Babecký et al. (2012), however, this does not necessarily imply that unit labor costs are rigid, since firms can reduce their wage bill by altering bonuses and benefits, changing shifts, or hiring cheaper workers, for instance. This dimension is not explicitly considered below, however, due to the current model structure.

Concerning the wage bargaining framework, it is assumed that:

1. Nominal wages cannot be cut.
2. Wages are bargained locally at the firm level. Nominal wages are a weighted average between the wage desired by firms and the wage desired by their current employees. This weight may or may not vary with the employment rate, depending on the values of the parameters $\phi_0 \geq 0$ and $\phi_1 \geq 0$ in Equation A.13.
3. Newly hired employees receive the same wage as incumbent employees. There is no individual wage bargaining during hiring.

3 Analysis of results

The model is simulated for 300 periods (100 transient periods and 200 considered periods). For each scenario, we take the average of the 100 Monte Carlo runs. The initial values and parameters for the first scenario (*Inf1*) are reported in the Appendix B, while Tables 1 and 2 below report the changes in parameter values across the different scenarios discussed in the subsequent sections.

Table 1: Simulation scenarios

Symbol	Description	Inf1	Inf2	Inf3	Dist1	Dist2	Dist3	Dist4
γ	Sensitivity of workers desired wage to employment status	0.00	0.01	0.02	0.02	0.02	0.02	0.02
ν_3	Sensitivity of markup to changes in unit costs (C firms)	0.00	0.00	0.00	0.00	0.10	0.25	0.50
κ	Sensitivity of firms' desired wages to inflation	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Type of survey for wage bargaining	Internal	Internal	Internal	Internal	Internal	Internal	Internal
ϕ_0	Fixed workers' bargaining power	0.40	0.40	0.40	0.40	0.40	0.40	0.40
ϕ_1	Sensitivity of workers' bargaining power to employment rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ϕ_2	Wage shock	0.00	0.00	0.00	0.10	0.10	0.10	0.10

Table 2: Simulation scenarios (cont.)

Symbol	Description	Ind1	Ind2	Ind3	Surv1	Surv2	Barg1	Barg2	Barg3
γ	Sensitivity of workers desired wage to employment status	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
ν_3	Sensitivity of markup to changes in unit costs (C firms)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
κ	Sensitivity of firms' desired wages to inflation	0.00	0.50	1.00	1.00	1.00	0.00	0.00	0.00
	Type of survey for wage bargaining	Internal	Internal	Internal	Internal	External	Internal	Internal	Internal
ϕ_0	Fixed workers' bargaining power	0.40	0.40	0.40	0.40	0.40	0.40	0.00	0.00
ϕ_1	Sensitivity of workers' bargaining power to employment rate	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.00
ϕ_2	Wage shock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.1 Conflicting-claims inflation and microfoundations

This section aims to investigate under which conditions two main features of the conflicting-claims inflation model emerge in the microfounded agent-based model proposed in the previous section. Accordingly, two features are investigated: i) the level of inflation; ii) whether wage shocks are partially translated to price and distribution effects. With respect to the latter aspect, we also investigate whether heterogeneity and competition among firms is a sufficient condition for wage adjustments to generate changes in distribution by applying a one-time nominal wage increase shock.

The first issue to be investigated is whether the model is able to generate positive inflation rates. In the conflicting-claims inflation model, inflation emerges through the disagreement between workers and firms concerning the distribution of income. In the agent-based model discussed above, this disagreement has two dimensions: i) the nominal wage negotiated between firms and workers; ii) the price adjustment following nominal wage changes. If there is no disagreement in the first dimension, there is no reason for price adjustments and inflation tends to be null.

This is confirmed in Figure 2 where three scenarios are compared. In all scenarios, firms' desired wages are not adjusted by inflation, while workers' always index their wages to past inflation. The scenarios differ with respect to whether workers desired wages are sensitive to their employment status (captured the parameter $\gamma \geq 0$). Disagreement between firms and workers only emerges when $\gamma > 0$ and, when it happens, nominal wage increases tend to be fully passed on to prices, thus generating inflation.

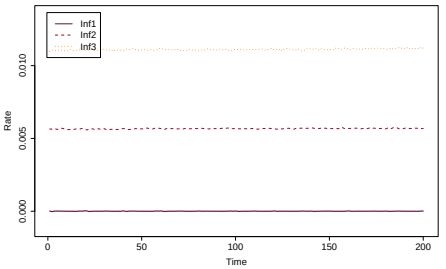
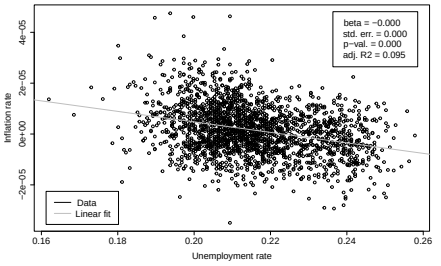


Fig. 2: Inflation rates

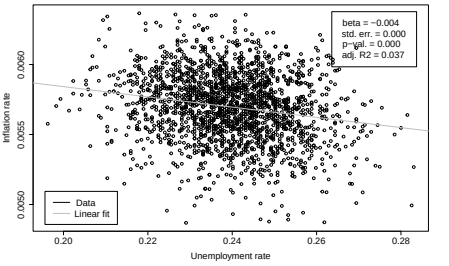
Note: Average of 100 Monte Carlo runs. Source: Own elaboration based on simulation results.

Indeed, Figure 2 shows that when $\gamma = 0$ (*Inf1*) inflation tends to be null. In the other scenarios, where $\gamma > 0$, there is some degree of bargaining between workers and firms over nominal wages and firms face an (undesired) increase in unit labor costs, which is passed on to prices. As a consequence, inflation becomes positive. The larger the value of γ, the larger the cost increases and, thus, the larger the inflation rate.

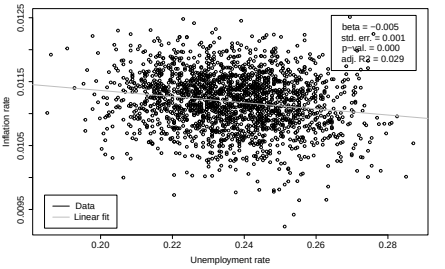
Moreover, Figure 3 shows that the Phillips curve is an emergent property in the scenarios where $\gamma > 0$. The first scenario presents an angular coefficient for the Phillips curve that is not economically meaningful, albeit statistically significant. The second scenario, where $\gamma > 0$, shows an economically meaningful Phillips curve, wherein there is a trade-off between inflation and unemployment. This trade-off becomes more relevant the larger the value of γ, as suggested by the comparison between the Phillips curve for the *Inf2* and *Inf3* scenarios.



(a) Inf1



(b) Inf2



(c) Inf3

Fig. 3: Phillips curves

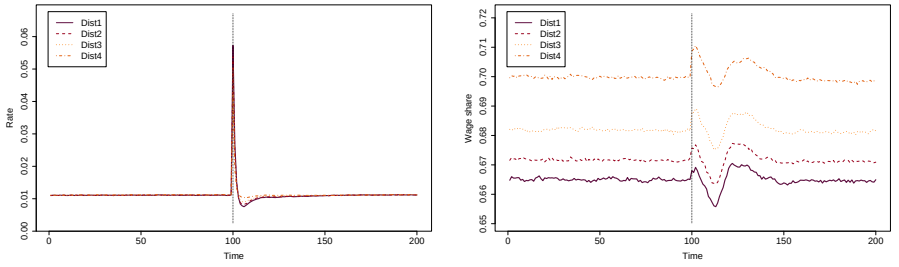
Note: Periods: 281 to 300. The number of periods has been adjusted to allow a better visualization. Source: Own elaboration based on simulation results.

The second issue to be investigated is whether inflation and distribution are related. In the conflicting-claims inflation model, inflation and distribution are considered the joint outcomes of the wage and price setting processes. This reflects an understanding that there is a partial pass-through of costs to prices, so that any change in unit labor costs are partially translated into price changes and partially translated into markup changes. In the agent-based model, the existence of a partial pass-through of costs do prices depends on how firms deal with unit cost changes. As discussed above, firms may increase prices or reduce profit margins as a response to wage shocks (Bertola et al.,

2012) and, in the proposed model, this is regulated by the parameter $\nu_3 \geq 0$. The larger the value of ν_3, the more firms absorb cost increases by reducing their markup rates. Conversely, when $\nu_3 = 0$, there is no direct effect of cost increases on firms' markup rates, which are entirely passed on to prices.

To investigate this issue, we apply at time 100 a wage shock represented by a percentage increase (given by $\phi_2 > 0$) of the wage set by firms. We assume that 50% of firms are subject to this shock;[3] and analyze what happens to distribution and inflation for different values of ν_3.

Figure 4 reports the results for inflation and the wage share. In all scenarios there is an increase in the inflation rate and the wage share immediately after the shock at period 100. The increase in the inflation rate is larger the smaller the value of the ν_3 parameter, and conversely for the wage share. Therefore, the model captures a connection between inflation and distribution that is well established in all versions of the conflicting-claims inflation model. The subsequent fall in the wage share observed in all scenarios results from its countercyclical dynamics - a feature also emphasized by post-Keynesian authors (Lavoie, 2009). Since the initial increase in the wage share stimulates a decrease in the unemployment rate, there is a fall in the wage share after a few periods, in particular of the wage share of indirect workers, who represent overhead labor in the model.



(a) Inflation rate (b) Wage share

Fig. 4: Inflation and distribution - Wage shock to 50% of firms

Note: Average of 100 Monte Carlo runs. Source: Own elaboration based on simulation results.

An interesting result from Figure 4 is that even when there is no direct effect of costs on firms' markup rates ($\nu_3 = 0$ in scenario *Dist1*) the shock on nominal wages generates an increase in the wage share immediately after the shock. This suggest that competition among firms may be a sufficient condition for creating a link between nominal wage dynamics and distribution, as argued by Sylos-Labini (1979). Nonetheless, this link is much stronger when firms' markup rates are sensitive to changes in unit costs ($\nu_3 > 0$).

[3]Firms that experience this shock are randomly selected.

To sum up, the results from the agent-based model provide important evidence that the main relationships captured by the conflicting-claims inflation model in the post-Keynesian literature are consistent with microfoundations from the empirical literature. Indeed, we find that inflation and distribution dynamics can be explained by disagreements between workers and firms. Our agent-based model also suggests that this disagreement can take place at the nominal wage determination stage. As discussed below, this dimension can have important implications for the shape of the Phillips curve given its influence on the degree of wage indexation.

3.2 Alternative versions of the Phillips Curve

The Phillips curve is a property of conflicting-claims inflation models where there is some link between workers' bargaining power and/or desired wages and the unemployment rate (Hein and Häusler, 2024; Rochon and Setterfield, 2007; Summa and Braga, 2020). This framework is consistent with different versions of the Phillips curve - original or accelerationist -,[4] depending on how indexation and bargaining power are treated (Hein and Häusler, 2024) or depending on the frequency of wage and price increases (Serrano et al., 2024).

The different versions of the Phillips curve generated by the conflicting-claims inflation models have spurred an ongoing debate about how to model conflicting-claims inflation appropriately. Recent contributions in this direction are Hein and Häusler (2024) and Serrano et al. (2024), for instance. In line with the traditional approach to the topic, these discussions focus mostly on the implications of different macroeconomic equations. This section aims to contribute to this debate by relating the shape of the Phillips curve and stability of the inflation rate to the different assumptions concerning individual and heterogeneous behavior informed by the empirical literature discussed above.

Accordingly, this section expands the possible behaviors of agents in face of changing conditions to investigate their implications for the shape of the Phillips curve. The behavioral assumptions concern whether firms' index their desired wages to inflation; the type of survey undertaken to assess workers' desired wages; and the sensitivity of workers' bargaining power to the unemployment rate. For each type of behavior, we explore the shape of the Phillips curve and the stability of the inflation rate.

3.2.1 Indexation

Indexation of nominal wages to past inflation can alter substantially the nature of the Phillips curve, as argued by Hein and Häusler (2024). This is an important assumption that differentiate models in the conflicting-claims inflation tradition, such as Blecker and Setterfield (2019), Dutt (1987), Hein (2023), Lavoie (2022, ch. 8), Rowthorn (1977), and Summa and Braga (2020).

[4] In the original Phillips curve, there is a relation between the level of the unemployment rate and the level of the inflation rate. In the accelerationist Phillips curve, there is a relation between the level of the unemployment rate and the change in the inflation rate.

These different versions give rise, in this tradition, to either the original or accelerationist the Phillips curve.

Although framed in a different manner, there is some connection between the different versions of the Phillips curve in this heterodox tradition and its derivation in the mainstream literature following the wage-setting and price-setting (WS-PS) model (Blanchard, 2018).[5] In the mainstream literature, wage indexation to inflation expectations is always complete, but there are different ways to model expectations formation. Anchored expectations give rise to the original Phillips curve, while adaptive expectations give rise to the accelerationist Phillips curve.

As explained by Lavoie (2024, p. 11), *"post-Keynesians prefer to argue that workers incorporate past inflation rates in their wage demands, rather than some hypothetical expected inflation rate"* and some models assume partial indexation power for both firms and workers. This partial indexation is explained, for instance, by the frequency of wage and price adjustments (Serrano et al., 2024). Another possible explanation for partial indexation in the case of wages, which is dealt with in this section, is that the wage bargaining process between firms and workers does not guarantee full indexation. This possibility would question the assumption of complete wage indexation in the mainstream literature as well as in some heterodox models.

In this section, we explore the implications of incorporating full indexation of wages to inflation by considering that firms index their desired wages to inflation. In the first scenario (*Ind1*), there is no sensitivity of firms' desired wages to inflation. In the second and third scenarios (*Ind2* and *Ind3*), firms' adjust their desired wages to past inflation with a sensitivity of $\kappa = 0.5$ and $\kappa = 1$ respectively. In all scenarios we assume that $\nu_3 = 0$, which means that markup rates are not directly affected by unit labor costs dynamics.

Figure 5 shows the dynamics of the inflation rate for the different scenarios. Inflation rates tend to be stable as long as $\kappa < 1$. This suggests that different versions of the Phillips curve may be more adequate for each scenario.

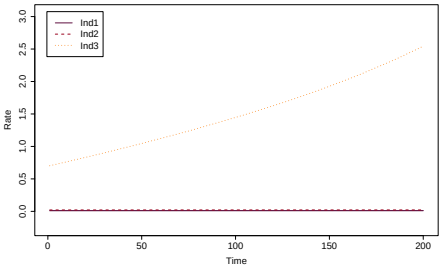
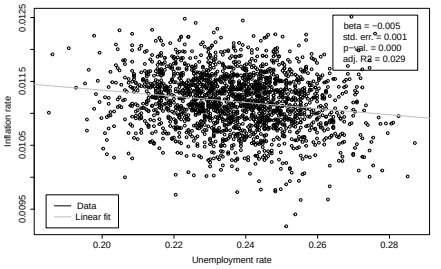


Fig. 5: Inflation rates - Indexation strategies

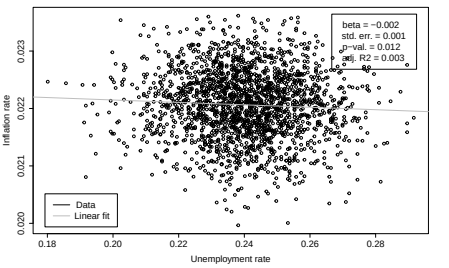
Note: Average of 100 Monte Carlo runs. Source: Own elaboration based on simulation results.

[5]See Lavoie (2024) for a comparison between the WS-PS model and the conflicting-claims inflation model.

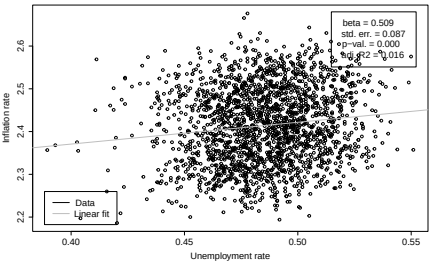
Indeed, Figure 6 shows that the original Phillips curve is only valid for the scenarios wherein $\kappa < 1$. In this context, the indexation of firms' desired wages to inflation alters the slope of the original Phillips curve (comparison between *Ind1* and *Ind2*). When $\kappa = 1$ (scenario *Ind3*), the original Phillips curve no longer applies, while the accelerationist Phillips curve is valid (Figure 7).



(a) Ind1



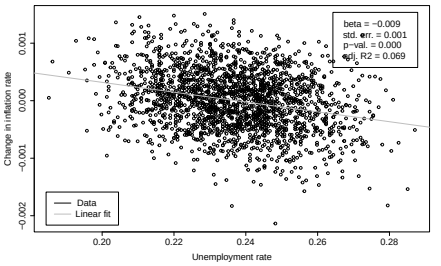
(b) Ind2



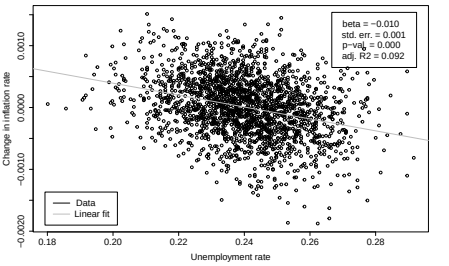
(c) Ind3

Fig. 6: Original Phillips curves - Indexation strategies

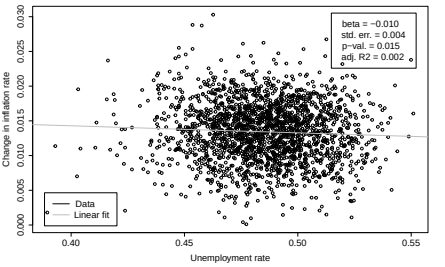
Note: Periods: 281 to 300. The number of periods has been adjusted to allow a better visualization. Source: Own elaboration based on simulation results.



(a) Ind1



(b) Ind2



(c) Ind3

Fig. 7: Accelerationist Phillips curves - Indexation strategies

Note: Periods: 281 to 300. The number of periods has been adjusted to allow a better visualization. Source: Own elaboration based on simulation results.

Therefore, full indexation of nominal wages to past inflation affects the validity of the original Phillips curve, as discussed in the post-Keynesian approach (Hein and Häusler, 2024). However, in the experiments reported in this section it has been assumed that $\nu_3 = 0$. This is not a very sound micro-foundation, since markup adjustments in face of wage increases are common (Bertola et al., 2012). In the model proposed here, full indexation combined with $\nu_3 > 0$ could generate an unrealistic wage share of 100%. This creates some difficulties for defending the robustness of the full indexation scenario, at least in the current model structure.

3.2.2 Survey

In the macroeconomic conflicting-claims inflation model, the degree of indexation of nominal wages appears as a property of nominal wage adjustment equations. While full indexation is not adopted in all variants of the model, Hein (2023) argues that it would be appropriate to consider that workers have the power to fully incorporate inflation expectations if it is also assumed that they can aim at a higher real wage.

However, the degree of indexation may actually be an emergent property of the wage bargaining process. Indeed, if wages are decided in collective agreements at the firm level, it seems appropriate to consider that there is first a decision about the degree of indexation of past inflation and only at a second stage a decision about real wage growth. Even in this case, however, one cannot guarantee that collective agreements are always effective in fully indexing nominal wages to past inflation. This creates the possibility of a non-linearity in the wage adjustment equation from the conflicting-claims inflation model.[6] Moreover, if collective agreements are not the norm, it is possible that firms decide nominal wages based on the labor market scenario and make "take it or leave it" offers to workers, so indexation may be incomplete.

Our review of the empirical literature suggests that the relevance of collective agreements varies depending on the period and the country (Bhuller et al., 2022). It thus seems appropriate to consider two alternative frameworks for nominal wage setting that roughly reflect the collective bargaining and the "take it or leave it" frameworks.

To do so, we assume that firms index their desired wages to the previous inflation rate ($\kappa = 1$), so that any disagreement between firms and (employed) workers refers to the increase in real wages. We then explore how the Phillips curve varies depending on whether there is a collective bargaining (*Surv1* scenario) or wages are unilaterally defined by firms who, nonetheless, consider labor market conditions through a random survey with (employed and unemployed) workers (*Surv2* scenario).

Figure 8 shows the dynamics of the inflation rate for both scenarios. The first scenario reproduces the instability of inflation rates verified in the previous section when $\kappa = 1$. The second scenario also presents $\kappa = 1$, but firms consider a random survey with workers for assessing the desired wage of workers. This generates a stable inflation rate.

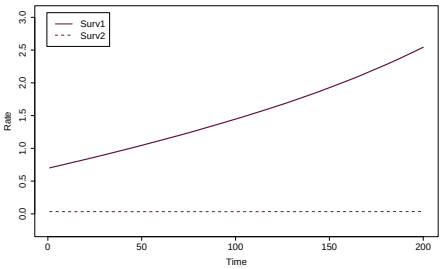
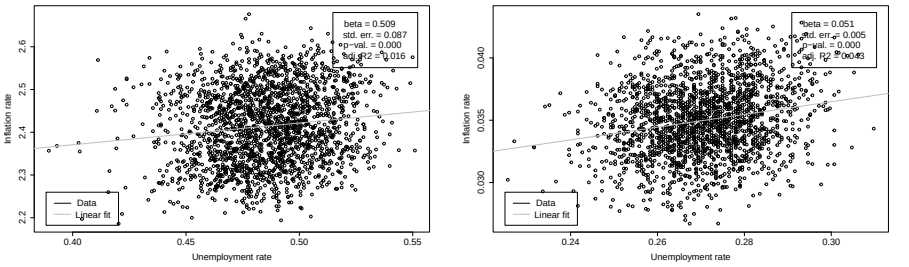


Fig. 8: Inflation rates - Survey options

Note: Average of 100 Monte Carlo runs. Source: Own elaboration based on simulation results.

[6]For instance, it is possible that the degree of indexation of nominal wages to past inflation depends on the unemployment rate if the latter is above a certain level.

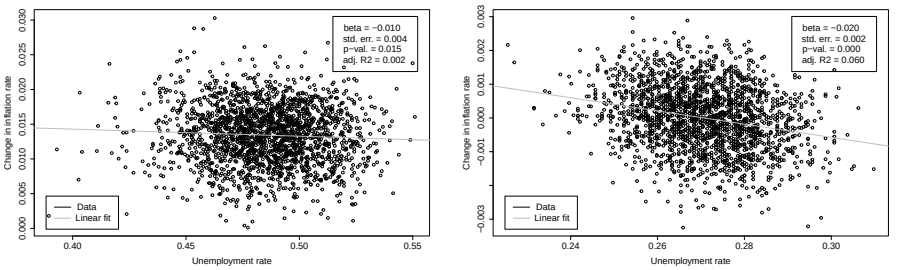
Figure 9 shows that the original Phillips curve does not apply for either scenario. Conversely, Figure 10 suggests that the accelerationist Phillips curve is valid for both scenarios. This suggests that firms' willingness to readjust wages according to past inflation rates can generate the emergence of the accelerationist Phillips curve even if unemployed workers' desired wages influences the nominal wage setting process.



(a) Surv1 (b) Surv2

Fig. 9: Original Phillips curves - Survey strategies

Note: Periods: 281 to 300. The number of periods has been adjusted to allow a better visualization. Source: Own elaboration based on simulation results.



(a) Surv1 (b) Surv2

Fig. 10: Accelerationist Phillips curves - Survey strategies

Note: Periods: 281 to 300. The number of periods has been adjusted to allow a better visualization. Source: Own elaboration based on simulation results.

Nevertheless, the type of survey for workers' desired wages exerts an important effect on the shape of the accelerationist Phillips curve. Our results suggest that collective bargaining (*Surv1*) creates a certain degree of isolation from the labor market dynamics. On the other hand, when firms decide nominal wages unilaterally by assessing the desired wage of workers through a random survey, there is more connection between unemployment and inflation, as reflected by

the larger magnitude of the angular coefficient of the accelerationist Phillips curve (*Surv2*).

3.2.3 Bargaining

The last aspect explored in this article is the degree of bargaining power of workers. In the conflicting-claims inflation model, the degree of bargaining power of workers is expressed through the intensity of nominal wage adjustments, while that of firms is captured in the intensity of price adjustments. These wage and price adjustments have implications for the real wage, as discussed by Lavoie (2014, ch. 8).

In the agent-based model proposed in this article, the degree of bargaining power of workers is expressed in the extent to which nominal wages come close to their desired wages, which is reflected in the value of the ϕ_0 and ϕ_1 parameters. In all scenarios so far, we have assumed that there was a fixed bargaining power of workers ($\phi_1 = 0$), so that the only aspect justifying the emergence of a Phillips curve was the sensitivity of workers' desired wages to the unemployment rate (as explored in Section 3.1). We now compare a scenario where there is a fixed value for the bargaining power of workers (*Barg1*) with two scenarios where the bargaining power of workers is flexible, with $\phi_1 = 0.5$ and $\phi_1 = 1$ in scenarios *Barg2* and *Barg3* respectively.[7]

Figure 11 shows the inflation rate for each scenario. The level of the inflation rate is very similar in scenarios *Barg1* and *Barg2*, suggesting that the link between workers' bargaining power and the unemployment rate is insufficient to generate an increase in the inflation rate when $\phi_1 = 0.5$. Nevertheless, the larger ϕ_1 in *Barg3* is associated with an increase in the inflation rate, which also presents a trend. This could result either from an accelerationist Phillips curve, or from a trend in the unemployment rate.

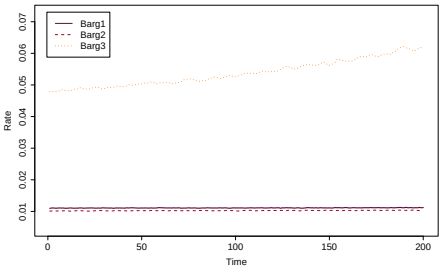
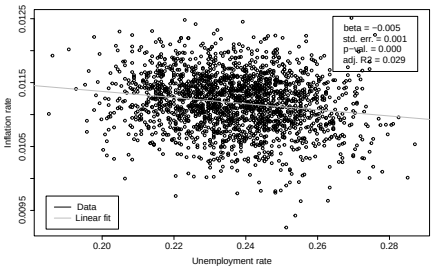


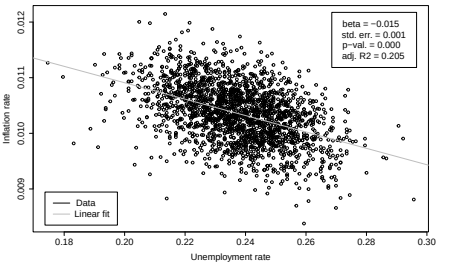
Fig. 11: Inflation rates - Workers' bargaining power

Note: Average of 100 Monte Carlo runs. Source: Own elaboration based on simulation results.

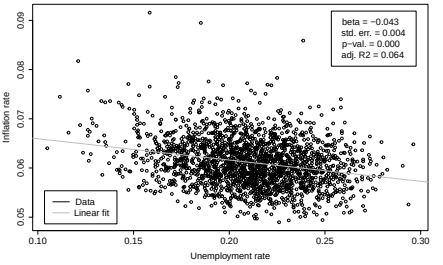
[7] Similar experiments, which obtained similar results, are reported in Rolim et al. (2023, 2024). However, these experiments did not explore the possibility of fixed values of workers' bargaining power.



(a) Barg1



(b) Barg2



(c) Barg3

Fig. 12: Original Phillips curves - Workers' bargaining power

Note: Periods: 281 to 300. The number of periods has been adjusted to allow a better visualization. Source: Own elaboration based on simulation results.

Figure 12 reports the original Phillips curve for each scenario. As expected, strengthening the connection between nominal wages and the unemployment rate by setting $\phi_1 > 0$ is associated with a larger magnitude of the slope of the Phillips curve. Moreover, a larger value of ϕ_1 is associated with a steeper Philips curve. The original Phillips curve is valid in all cases, which is coherent with the need of firms' desired wages being indexed to inflation in order to the accelerationist Phillips curve emerge (as explored in Section 3.2.1)

To reconcile the stable original Phillips curve with an unstable inflation rate in the *Barg3* scenario, one needs to refer to other elements of the model. Indeed, (unreported) results suggest that when $\phi_1 = 1$ there is an increase in competition among firms associated with the fact that there is larger dispersion in costs and wages. As a consequence, it is also possible to observe an increase of exit of firms, which through the model framework also affects the markup rate. There is a downward trend in unemployment that may be associated with the observed increase in investment (associated with the entry of new firms). Thus, it is probably the decrease in the unemployment rate that explains the instability of the inflation rate in this scenario.

4 Conclusion

This article has investigated the inflation dynamics in an agent-based model. In an effort to establish a connection with the post-Keynesian conflicting-claims inflation model, it has been shown that the latter is fully compatible with microfounded behavior in wage and price setting and labor market framework. This suggests that the conflicting-claims inflation model is a robust framework for studying inflation (and distribution) dynamics in a macroeconomic environment.

The article also explored different forms of the Phillips curve depending on different assumptions concerning individual behavior. We have found that it is possible for the Phillips curve to emerge even if workers' bargaining power is not sensitive to the unemployment rate and as long as their desired wages have some connection with their individual employment status. However, the magnitude of the slope of the Phillips curve increases when workers' bargaining power is also sensitive to the unemployment rate.

The results suggest that incomplete indexation of wages to past inflation can emerge from wage negotiations even if workers fully index their desired wages to inflation and as long as firms do not do so. However, incomplete indexation does not necessarily emerge from unemployed workers' desired wage adjustments in a context of "take it or leave it" offers by firms. Therefore, in line with the post-Keynesian literature, the accelerationist Phillips curve seems to emerge when there is full indexation of nominal wages to past inflation.

Yet, the specific conditions for the emergence of the accelerationist Phillips curve - in particular, full indexation of nominal wages to past inflation - seem hard to reconcile with the empirical evidence discussed in Section 2. This evidence suggests that despite inflation being the most important driver of frequent wage adjustments, not all firms adopt (formal or informal) rules to adjust wages to inflation (Druant et al., 2012). And when they do, part of wage increases are absorbed through profit margins reductions (Bertola et al., 2012). This represents a challenge for an adequate microfoundation of the accelerationist Phillips curve, in particular when collective bargaining is not widespread.

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Appendix A: Model description

The following sections summarize the main equations for each type of agent. The model version reported here is similar to that in Rolim et al. (2024), presenting some simplifications and minor changes to incorporate the features discussed in Section 2.[8]

A.1 The capital goods firm

The monopolist capital goods firm produces machines that consumption goods firms acquire. These machines produce up to Q_m^{fc} units of consumption goods and are characterized by a direct labor productivity of y^c. Each machine can be used for a maximum of $T^k > 0$ periods, after which they are scrapped.

The desired production level for the capital goods firm is equal to the investment demand by the consumption goods firms ($\sum_{c=1}^{N^c} I_{c,t}^D$). After these firms place their orders, the capital goods firm determines its labor demand for direct and indirect workers, with the former directly involved in production and the latter serving as managers and supervisors. The labor demand for each type of workers is given by Equations A.1 and A.2, respectively:

$$L_{k,t}^{D,dir} = \left\lceil \frac{\sum_{c=1}^{N^c} I_{c,t}^D}{y^k} \right\rceil \tag{A.1}$$

$$L_{k,t}^{D,ind} = \left\lfloor \rho_1 L_{k,t}^{D,dir} \right\rfloor \tag{A.2}$$

where y^k is the direct workers' productivity in the production of capital goods and ρ_1 is the fixed number of managers per direct worker. The capital goods firm pays wages after the consumption goods firms have paid for the capital goods, so its current revenue finances production costs.

The production level of the capital goods firm is determined by the floor of the number of direct workers hired during the period multiplied by their productivity. Formally, production is given by

$$Q_{k,t} = min \left\{ \lfloor L_{k,t}^{dir} y^k \rfloor, \sum_{c=1}^{N^c} I_{c,t}^D \right\} \tag{A.3}$$

Since the firm never produces more than what is demanded by the consumption goods firms, the second term of Equation A.3 captures the maximum production level, given by the demand for capital goods ($\sum_{c=1}^{N^c} I_{c,t}^D$).

The price of the new machines is determined by a fixed markup rate applied to the unit labor costs, as follows:

[8] The following subscripts are used throughout the text: h for households, c for consumption goods firms, m for machines, k for the capital goods firm, f for both firms, b for the bank, and g for the public sector. Meanwhile, the superscripts res, man, ind, dir, and cap refer to researchers, managers, indirect workers, direct workers, and capitalists, respectively, whereas j refers to households from all classes. The superscripts \$, D, d, and e identify nominal, demand, desired, and expected variables, respectively. Variables that are not accompanied by \$ are real variables. Finally, the subscript t identifies the period, and each period represents a quarter.

$$p_{k,t}^{\$} = (1+\mu_k)\frac{(w_{k,t}^{dir,\$} + \rho_1 w_{k,t}^{ind,\$})}{y^k} \tag{A.4}$$

where μ_k is a fixed markup rate and $w_{k,t}^{j,\$}$ is the wage rate for each type $j = dir, ind$ of worker.

A.2 The consumption goods firms

The consumption goods sector is composed of N^c firms that produce a homogeneous nonperishable good using labor and capital goods. Production is sold to households in a decentralized consumption goods market with imperfect competition.

Firms form their sales expectations based on their experience in the consumption goods market (Gennaioli et al., 2016; Boneva et al., 2020). This is formally represented as follows:

$$Q_{c,t}^{D,e,t} = \sum_{i=1}^{4} \omega_i Q_{c,t-i}^{D} \tag{A.5}$$

where $Q_{c,t-i}^{D}$ is the demand for the firms' products in $t-i$ and $\omega_1 > \omega_2 > \omega_3 > \omega_4 > 0$ are fixed parameters ($\sum_i^4 \omega_i = 1$). The desired production level ($Q_{c,t}^{d}$) is set by also accounting for a fixed desired share of inventories (n^{IN}) relative to $Q_{c,t}^{D,e,t}$ and deducting the inventory level from the previous period.

The demand for direct and indirect workers is given by Equations A.6 and A.7, respectively. Direct workers are also responsible for directly producing goods in this sector. Meanwhile, indirect workers are hired to supervise direct workers as well as manage the firm, so they are demanded in proportion to the demand for direct workers and the size of the firm (proxied by the number of direct workers at full capacity utilization).

$$L_{c,t}^{D,dir} = \left\lceil \frac{Q_{c,t}^{d}}{y^c} \right\rceil \tag{A.6}$$

$$L_{c,t}^{D,ind} = \lfloor \rho_2 L_{c,t}^{D,dir} + \rho_3 L_{c,t}^{dir,fc} \rceil \tag{A.7}$$

where $\rho_{2,3} > 0$ are parameters and $L_{c,t}^{dir,fc}$ is the demand for direct labor at the full capacity production level.

Prices are determined by applying a variable markup rate to unit labor costs calculated at the desired capacity utilization level. There are two levels of markup determination, which reflect a firm's position relative to its competitors and workers. As reported in Equation A.8, the first component ($\mu_{c,t}^{*}$) depends on the evolution of firms' market share, which contains information concerning each firm's position relative to its competitors (Dosi et al., 2010; Dweck et al., 2020).

The second component ($m_{c,t}$) is the deviation from $\mu_{c,t}^{*}$, which has been first introduced by Rolim et al. (2023). As reported in Equation A.9, this component

depends on the evolution of nominal wages, thus capturing firms' situation *vis-à-vis* workers and connecting workers' bargaining power with firms' pricing decisions.

$$\mu^*_{c,t} = \mu^*_{c,t-1}[1 + \nu_1(ms_{c,t-1} - ms_{c,t-2})] \tag{A.8}$$

$$m_{c,t} = \nu_2 m_{c,t-1} - \nu_3 \left(\frac{\Delta\Gamma^{u,\$}_{c,t}(u^d)}{\Gamma^{u,\$}_{c,t-1}(u^d)} \right) \tag{A.9}$$

where $\nu_1 > 0$ is the sensitivity of the markup to the firm's market share, $ms_{c,t}$ denotes the firms' market share (sales relative to aggregate sales), $1 > \nu_2 > 0$ represents the persistence in the markup deviation, $1 > \nu_3 > 0$ is the sensitivity of the markup deviation to changes in unit costs, and $\Gamma^{u,\$}_{c,t}(u^d)$ is the firms' unit costs at the desired capacity utilization rate (u^d). Prices are given by $p = (1 + \mu^*_{c,t} + m_{c,t})\Gamma^{u,\$}_{c,t-1}(u^d)$.

Firms invest in new machines when the expected capacity utilization exceeds the desired level. They first calculate their desired capital stock in $t+1$, which is based on the desired capacity utilization rate ($Q^{fc,d}_{c,t} = Q^{e,t+1}_{c,t}/u^d$). The desired investment is then composed of the replacement investment, which is the investment level required to maintain the current production capacity by replacing machines older than T^k periods (as long as firms do not wish to reduce their capital stock), and the expansion investment, which is given by the difference between the current full capacity and $Q^{fc,d}_{c,t}$ multiplied by an investment adjustment speed parameter ($1 > v > 0$). This means that firms react slowly to changes in expected sales due to the inherent high uncertainty associated with investment.

These firms can apply for a bank loan to cover their production and investment expenses when necessary. The bank only grants credit to clients who are considered creditworthy (Section A.3). Firms are evaluated by the ratio of interest payments to their average revenue over the previous four periods (adjusted to the current price level). They are considered creditworthy if this ratio is less than the maximum ratio $R > 0$.

Finally, the established firms exit the market whenever their market share is below a threshold given by the $1 > ms^{min} > 0$ parameter, when they have no production capacity, or when they have no deposits available and cannot request loans to cover their production or investment projects (i.e., when they are completely liquidity constrained). Each exited firm is replaced by a new firm, which is owned by ρ_4 capitalists selected from among the capitalists whose previous firm left the market in the period. Their initial investment is equal to a share $1 > \delta > 0$ of the average capital stock of the established firms. For $T^c > 0$ periods after their entry, they receive the requested loan and are not subject to the exit criteria.

A.3 The bank

The banking sector is represented by a monopolist bank that provides credit to firms and households and purchases government bonds. It also holds non-interest-bearing deposits owned by all private agents in the model. The interest rate on loans is equal to the interest rate set by the central bank (i).[9]

A.4 The households

Households are divided into three heterogeneous classes that participate in various ways in the production process (Mohun, 2016). Accordingly, there are N^{dir} direct workers, N^{ind} indirect workers, and N^{cap} capitalists. Capitalists own the firms and receive profit dividends (each firm is owned by ρ_4 capitalists). Meanwhile, workers receive wages from firms when employed and unemployment benefits from the government when unemployed.

Workers' desired wage depends on their employment history (Blanchflower, 1991) and on the inflation rate. Workers employed in the previous period desire a wage equal to their previous wage adjusted by the inflation rate (if positive) and a positive adjustment factor γ. Workers who were unemployed in the previous period reduce their desired wage by a factor γ multiplied by the number of periods in which they were unemployed since their last employment. Formally, workers' desired wage is given by Equation A.10:

$$w_{h,t}^{d,\$} = \begin{cases} w_{h,t}^{d,*,\$}(1+\gamma) & \text{if } T_{h,t}^{w} = 0 \\ w_{h,t}^{d,*,\$}(1-\gamma T_{h,t}^{w}) & \text{otherwise.} \end{cases} \tag{A.10}$$

where $w_{h,t}^{d,*,\$}$ is the previous strictly positive wage adjusted by the inflation rate (if positive), $\gamma > 0$ denotes a parameter capturing the sensitivity of the desired wage to the employment status, and $T_{h,t}^{w}$ is the number of periods since the workers' last employment (if a worker was employed in $t-1$, $T_{h,t}^{w} = 0$).

Workers consider looking for a new job when the wage offered by their current employer falls below their individual desired wage and the market average wage. This decision is based on a random draw from a Bernoulli distribution, with the probability of success determined by a parameter $s > 0$ multiplied by the difference between the wage offered by the current employer and the average wage in the market divided by the latter. When employed workers look for new jobs, they accept job offers with wages above the wage their current employer offers. Meanwhile, unemployed workers are constantly looking for new opportunities and accept any job offer made by firms.

Household consumption depends on their income. Households have different propensities to consume out of income because low-income households tend to consume relatively more from their income (Dynan et al., 2004; Taylor et al., 2017).

$$C_{h,t}^{D,\$} = c^{j}((w_{h,t}^{\$} + \Pi_{h,t-1}^{h,\$})(1-\tau) + d_{h,t}^{\$}) \tag{A.11}$$

[9]Since, for simplicity, we assume that the bank is not owned by any household, it accumulates its profits.

where $1 > c_2^{dir} > c_2^{ind} > c_2^{cap} > 0$ denotes the class-specific propensities to consume out of income, $w_{h,t}^{\$}$ is wages, $\Pi_{h,t-1}^{h,\$}$ is profit dividends, τ represents the tax rate on income, and $d_{h,t}^{\$}$ is the tax-exempt unemployment benefit.

A.5 The public sector

The public sector consists of the government and the central bank. The government collects taxes from households' income at a tax rate $\tau > 0$ and pays unemployment benefits to unemployed workers at a value equal to the minimum wage. It also hires a fixed number of public servants from each class (L_g^{dir} and L_g^{ind}), who are paid the average wage for their class in the consumption goods sector.

A.6 The labor market

There are two segmented labor markets, one for each type of worker. Firms use an internal pay structure, so employees in the same class at the same firm earn the same wage. While employment is full-time and long-term, workers may be fired whenever firms reduce their demand for labor or fire workers to meet their turnover target (a $1 > \vartheta > 0$ share of current employees).[10]

In each period, firms have a desired wage. This desired wage is based on the previous wage, which may be adjusted by an inflation index depending on the value of the parameter $\kappa \geq 0$, as reported below:

$$w_{f,t}^{j,d,\$} = w_{f,t-1}^{j,\$}(1 + \kappa \hat{p}_{t-1}^{i}) \tag{A.12}$$

where $\hat{p}_{t-1}^{i}$ is the inflation rate.

There are two possible frameworks for wage setting, which have implications for the value of the wage desired by workers ($w_{f,t}^{j,s,\$}$). In the **internal** framework, wages are set considering the desired wage of the firms' current employees. In the **external** framework, firms use labor market surveys to set wages (Bewley, 2007), consulting a random set of workers to consult their desired wage. The number of workers consulted is given by the parameter $1 > n^{j,s} > 0$ multiplied by the firms' labor demand for each type of worker $j = dir, ind$.

Wages are determined as the weighted average of the wage desired by firms and the wage desired by workers. The weight given to the desired wage by workers, which is a proxy for their bargaining power, has two components. The first is a fixed component, given by $\phi_1 \geq 0$. The second component is sensitive to the employment rate, with a sensitivity given by $\phi_2 \geq 0$. Accordingly, the wage set by firms is given by:

$$w_{f,t}^{j,\$} = [1 - (\phi_1 + \phi_2 \eta_{t-1})] w_{f,t}^{j,d,\$} + (\phi_1 + \phi_2 \eta_{t-1}) w_{f,t}^{j,s,\$} \tag{A.13}$$

where η_{t-1} is employment rate in the previous period.

[10] For simplicity, there is no turnover in the public sector.

The hiring process begins with a random list of firms, with the capital goods firm always ranked first. The first firm attempts to match with an indirect and a direct worker by randomly selecting one of each type. Subsequently, the second firm begins its hiring round and so on until all firms on the list have completed one hiring round for each type of worker. The process iterates until all firms have filled all open positions or reached the maximum number of hiring rounds for each type of worker, given by a multiple $n^w \geq 1$ of the number of open positions.

Finally, the labor market institutional framework is defined by a minimum wage ($w_t^{min,\$}$) and nominal downward wage rigidity (Bewley, 2007; Dickens et al., 2007). The minimum wage is adjusted according to the growth rate of the average nominal wage.

A.7 The consumption goods market

We consider a simple search-and-matching procedure inspired by Delli Gatti et al. (2010) and Terranova and Turco (2022), in which customers tend to be loyal to their previous supplier.

After determining their desired consumption level, households interact in the consumption goods market with firms in the following manner: each household compares the price of its preferred firm (the firm from which it shopped in the previous period) with the lowest price among a set of $\nu_4 \geq 1$ randomly selected firms. If the preferred firm's price is lower than the reference price, the household maintains its preferred firm. Otherwise, it may switch to the firm with the lowest price with a probability l_t, which is calculated as follows:

$$l_t = 1 - e^{\nu_5 (p_{new,t} - p_{old,t})/p_{new,t}} \tag{A.14}$$

where $\nu_5 > 0$ is the intensity of choice, $p_{new,t}$ is the price of the firm with the lowest price, and $p_{old,t}$ is the price of the preferred firm from the previous period. A Bernoulli draw based on this probability determines whether the household switches to the firm with the lowest price, which becomes its preferred firm for the current period.

Once the preferred firm has been (re)defined, the household demands the desired quantity of consumption goods from this firm. If this firm's supply is lower than the household's demand, the latter consumes as much as possible from this supplier before moving on to the next firms on its list (always visiting the firm with the lowest price first) until it has either met its entire consumption demand or visited all firms on its list.

The exit and entry of consumption goods firms impacts these processes. If a firm leaves the market, all customers for whom it was the preferred firm visit a number $\nu_4 + 1$ of firms in the following period and select a new preferred firm among those. Furthermore, when a new firm enters the market, it is included in the search-and-matching procedure.

A.8 Sequence of events

In each simulation period, the sequence of events is as follows:

1. Consumption goods firms set desired production levels.
2. Nominal wages and prices are set.
3. The credit market opens.
4. The consumption goods firms set investment demand, and all firms set labor demand.
5. The labor market opens.
6. Production in the capital and consumption goods sector takes place.
7. New machines are delivered, payments are made to the capital goods firms, and old machines are scrapped.
8. Unemployment benefits and wages are paid.
9. Households set their nominal consumption demand.
10. The consumption goods market opens.
11. Taxes and profit dividends are paid.
12. National accounts and statistics are computed.
13. The exit and entry of consumption goods firms take place.

Appendix B: Simulation parameters

The parameters and initial values of key variables for the *Inf1* scenario are listed below.

Table 3: Parameters and initial values

Symbol	Description	Value
γ	sensitivity of workers desired wage to employment status	0
δ	entrant firms' expected sales share of sector average sales (C sector)	0.5
ϑ	employees turnover share	0.05
κ	sensitivity of firms' desired wages to inflation	0
$\mu_{c,0}$	initial markup rate (C firms)	0.7
μ_k	markup rate (K firm)	0.5
ν_1	sensitivity of markup rate to market share (C firms)	1
ν_2	markup deviation persistence (C firms)	0.95
ν_3	sensitivity of markup deviation to unit costs (C firms)	0
ν_4	Number of firms visited by households (C market)	5
ν_5	Intensity of choice (C market)	1
ρ_1	number of capitalists per firm*	1

continued ...

... continued

Symbol	Description	Value
ρ_1	managers per direct workers (K firms)	0.16
ρ_2	indirect workers per direct worker (C firms)	0.085
ρ_3	indirect workers per direct worker at full capacity production (C firms)	0.065
ϱ_1	initial ratio between direct workers wage and minimum wage	2.5
ϱ_2	initial ratio between indirect workers wage and direct workers wage	2.5
τ	tax rate on income	0.05
ϕ_0	fixed workers' bargaining power	0.4
ϕ_1	sensitivity of workers' bargaining power to employment rate	0
$\omega_{1,2,3,4}$	sensitivity of expected demand to past demand (C firms)	(0.4, 0.3, 0.2, 0.1)
$c^{dir,ind,cap}$	propensity to consume out of income (direct workers, indirect workers, capitalists)	(0.95, 0.85, 0.75)
i	base interest rate	0.02
$L_g^{dir,ind}$	workers hired as public servants *	(230,39)
ms^{min}	minimum market share to stay in the market (C firms)	0.0025
N^c	number of consumption goods firms	200
$N^{dir,ind,cap}$	number of direct workers, indirect workers*, and capitalists*	(1696,286,201)
$n^{dir,ind}$	percentage of direct and indirect workers in total population	(0.844, 0.142)
n^g	proportion of public servants in total initial employment (direct workers)	0.16
n^{IN}	desired share of inventories	0.1
$n^{s,dir,ind}$	proportion of workers in survey	(0.15, 0.3)
n^w	number of hiring rounds per open position	1.5
$Q_{c,0}^{fc}$	initial full capacity production (C firms)	80
Q_m^{fc}	machines production at full capacity	2.5
R	maximum interest payments to cash flow ratio	0.05
s	sensitivity of probability of on-the-job search to difference in wages	5
T^c	number of periods before a new firm can exit the market	10
T^k	machines lifetime	20
u^d	desired capacity utilization level	0.8
$w_0^{min,\$}$	initial minimum wage	1
x	Beta distribution support parameter	0.15

Note: $\star$ identifies values determined in the model's initialization.