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INFLATION, CONFLICT, FREQUENCY OF ADJUSTMENTS AND THE EXCHANGE RATE: AN ANALYTICAL INVESTIGATION IN THE HISTORY OF ECONOMIC THOUGHT

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Dissertação apresentada ao Programa de Pós-Graduação em Economia (PPGE), do Instituto de Economia da Universidade Federal do Rio de Janeiro, como requisito para a obtenção do título de Mestre em Ciências Econômicas.

Orientador: Prof. Dr. Ricardo de Figueiredo Summa

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Rio de Janeiro, 27 de agosto de 2025

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ABSTRACT

This dissertation investigates the theoretical foundations underlying the dominant perspectives in the cost-push inflation literature within closed economies and seeks to clarify the role played by the exchange rate – both nominal and real – in the inflationary dynamics of open economies. Through an analytical study of the contributions from four groups of models (structuralist, inertialist, conflicting claims, and the models developed by Cambridge Economic Policy Group), the dissertation argues that inflation dynamics, as described by price-wage spirals, should be examined focusing on four highly interrelated analytical elements: exogenous variations in relative prices, conflicting claims over distribution, frequency of price and wage adjustments, and inertia. In order to extend the analysis to the context of open economies, we begin by assessing the analytical role of the exchange rate in three of the aforementioned model groups (structuralist, inertialist, and conflicting claims). Building upon the theoretical and analytical foundations discussed throughout the dissertation, we argue that changes in the nominal exchange rate generate a set of inflationary and distributive implications. First, nominal exchange rate variations directly affect the domestic-currency prices of tradable goods (assumed to be price takers), thereby initially altering the relative prices between tradables and non-tradables. However, relative price variation only occurs if the nominal exchange rate change also leads to a change in the real exchange rate – which we argue is the case in the immediate aftermath of an exogenous nominal depreciation. A real exchange rate depreciation intensifies the conflicting claims by reducing the real wage and the real mark-up in the non-tradable sector, while increasing the real mark-up in the tradable (price-taker) sector. This escalation of conflicting claims fuels higher inflation through a persistent process of price increases, wage hikes, and new rounds of nominal exchange rate depreciation. However, in the intervals between nominal exchange rate depreciations, domestic inflation appreciates the real exchange rate, until the next nominal adjustment induces another temporary real depreciation. Precisely because of the oscillatory behavior of the real exchange rate in an inflationary context, the frequency of nominal exchange rate adjustments becomes a key determinant of the frequency of price and wage adjustments, generating a nominal exchange rate-price-wage spiral. Finally, the dissertation discusses the analytical aspects of hyperinflationary processes, characterized by accelerationist dynamics of the exchange rate-price-wage spiral, with no intrinsic limits on the growth rates of these variables.

Key-Words: Inflation; Exchange-rate; Conflicting Claims; Relative Prices; Inertia.

RESUMO

Este trabalho investiga os aspectos teóricos que fundamentam as perspectivas dominantes na literatura de inflação de custos, em economia fechada, e busca esclarecer a função desempenhada pela taxa de câmbio (nominal e real) na dinâmica inflacionária, em economia aberta. Por meio de um estudo analítico das contribuições de quatro grupos de modelos (estruturalistas, inercialistas, *conflicting claims*, e da *Cambridge Economic Policy Group*), argumenta-se que a dinâmica da inflação descrita por "espirais preços-salários" deve ser investigada com foco em quatro elementos altamente inter-relacionados: variações exógenas de preços relativos, conflito distributivo, frequências de reajustes de preços e de salários, e inércia. Para ampliar a investigação ao contexto de economia aberta, inicia-se pela avaliação da função analítica da taxa de câmbio em três dos modelos discutidos anteriormente (estruturalistas, inercialistas e de *conflicting claims*). Sobre a base dos elementos teóricos investigados ao longo da dissertação, discutem-se os caminhos lógicos pelos quais variações da taxa de câmbio nominal estabelecem um conjunto de implicações inflacionárias e distributivas. Em primeiro lugar, variações do câmbio nominal estabelecem variações diretas nos preços de mercadorias *tradables* (*price takers*) em moeda doméstica, e assim alteram inicialmente os preços relativos entre mercadorias *tradables* e *non-tradables*. Entretanto, a variação de preços relativos só ocorre quando a variação da taxa de câmbio nominal estabelece também uma variação da taxa de câmbio real – e argumentamos que é isto que ocorre no momento imediatamente posterior à variação exógena do câmbio nominal, antes da generalização dos efeitos inflacionários da variação do câmbio nominal. Nesse contexto, a depreciação da taxa de câmbio real intensifica o conflito distributivo porque diminui o salário real e a margem de lucro real no setor *non-tradable*, enquanto amplia a margem de lucro real no setor *tradable* (*price-taker*), e este acirramento do conflito distributivo implica um maior nível de inflação descrito por um processo persistente de reajustes de preços, salários e novas rodadas de depreciação do câmbio nominal. Entretanto, em contexto inflacionário, nos intervalos entre reajustes do câmbio nominal, o câmbio real aprecia e o conflito distributivo diminui. Por causa da trajetória de oscilação câmbio real em contexto inflacionário, a frequência de reajustes da taxa de câmbio nominal se faz decisiva para a determinação das frequências de reajustes de preços e salários, formando uma espiral câmbio nominal-preços-salários. Por fim, discutimos os aspectos analíticos dos processos hiperinflacionários, caracterizados por dinâmicas aceleracionistas da espiral câmbio nominal-preços-salários sem limites intrínsecos às taxas de crescimento destas variáveis.

Palavras-Chave: Inflação; Taxa de Câmbio; Conflito Distributivo; Preços Relativos; Inércia.

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LIST OF ABREVIATIONS

CEPG – Cambridge Economic Policy Group

LIST OF SYMBOLS

P: is the general price index (or the price of an individual good, depending on the context in which it is used in the dissertation).

$\hat{P}$: is the inflation rate in domestic currency.

$\hat{P}^*$: is the inflation abroad.

$\hat{P}_{AN}$: is the inflation rate of non-tradable agricultural goods in domestic currency.

$\hat{P}_{AN}^*$: is the inflation rate of non-tradable agricultural goods in dollars.

$\hat{P}_{AT}$: is the inflation rate of tradable agricultural goods in domestic currency.

$\hat{P}_{AT}^*$: is the inflation rate of tradable agricultural goods in dollars.

$\hat{P}_{accumulated}$: is the accumulated inflation over the interval between nominal wage adjustments.

$\hat{P}^{equilibrium}$: is the equilibrium inflation rate.

$\hat{P}_i$: is the constant inflation rate in the interval between wage adjustments.

$\hat{P}_t$: is the inflation rate in period t.

$\hat{P}_{t-1}$: is the inflation rate in period t – 1.

W: is the average nominal wage.

$\widehat{W}$: is the rate of change of nominal wages.

$\widehat{W}_t$: is the growth rate of wages in period t.

$\widehat{W}_{t-1}$: is the growth rate of wages in period t – 1.

W_t: is the wage bill in period t.

W_{t+1} is the wage bill in period t + 1.

$\hat{Z}_{er}$: is an exchange rate shock related to a change in the real exchange rate.

$\hat{e}$: is the nominal exchange rate depreciation rate.

$\hat{e}_t$: is the nominal exchange rate depreciation rate in period t.

$\hat{e}_{t-1}$: is the nominal exchange rate depreciation rate in period t - 1.

λ_L: is the share of wage bill cost in the unit direct cost.

$(1-\lambda_L)$: is the share of input costs in the unit direct cost.

m^N: is the real mark-up in the non-tradable sector.

m^T: is the real mark-up in the tradable sector.

N^W: is the frequency of nominal wage adjustments in a reference period.

N^K: is the frequency of price adjustments in a reference period.

N^e: is the frequency of nominal exchange rate adjustments in a reference period.

P_A: is the average price of intermediate inputs used in the production process.

P_a^*: is the average price in dollars of the imported input used in production.

$P_{Agricultural}$: is the average price index of agricultural goods.

P_{Fix}: It is the average price index of the "Fix-Price" sector.

P_{Flex} It is the average price index of the "Flex-Price" sector.

P^M: is the average price of imported goods in domestic currency.

P^{M*}: is the average price of imported goods in dollars.

P^N: is the average price of non-tradable goods in domestic currency.

P_R: is the relative price index of a basket of 'Flex-Price' goods in units of a basket of 'Fix-Price' goods (equal to P_{Flex}/P_{Fix}).

P^T: is the average price of tradable goods in domestic currency.

P^{T*}: is the average price of tradable goods in dollars.

a^*: is the technical coefficient of output per unit of imported input used in production.

a_{MN}: is the quantity of imported goods used as inputs in the production process of one unit of a non-tradable good.

a_{MT}: is the quantity of imported goods used as inputs in the production process of one unit of a tradable good.

a_{NN}: is the quantity of non-tradable goods used as inputs in the production process of one unit of a non-tradable good.

a_{NT}: is the quantity of non-tradable goods used as inputs in the production process of one unit of a tradable good.

a_{TN}: is the quantity of tradable goods used as inputs in the production process of one unit of a non-tradable good.

a_{TT}: is the quantity of tradable goods used as inputs in the production process of one unit of a tradable good.

$\bar{b}$: is the average real wage in the interval between nominal wage adjustments.

b_0^W: is a positive parameter

b_0^k: is considered a constant parameter that varies inversely with the market power of firms.

$b^{equilibrium}$: is the equilibrium real wage

b^k: is the real wage target of firms.

b_k^{er}: is a positive parameter.

b_{max}: is the maximum real wage in the interval between nominal wage adjustments

b_{min}: is the minimum real wage in the interval between nominal wage adjustments.

b^w: is the real wage target of the workers.

b_w^{er}: is a positive parameter.

e_r: is the real exchange rate

m^*: is the desired real mark-up of the firms.

α^k: is the degree of price adjustment indexation relative to the previous period's wage increase.

α^w: is the degree of wage adjustment indexation relative to the previous period's price increase.

β^W is the parameter that captures workers' bargaining power.

β^k: is the parameter that captures firms' bargaining power.

γ: is a parameter positively related to the real exchange rate.

γ_1: is the share of prices of tradable agricultural goods in the total value of the basket of goods that composes the general price index of the "Flex-Price" sector.

γ_2: is the share of prices of non-tradable agricultural goods in the total value of the basket of goods that composes the general price index of the "Flex-Price" sector

λ_0 is the portion of the inflation of $\hat{P}_{Fix}$ generated by the increase in nominal wages;

λ_1 is the portion of the inflation of $\hat{P}_{Fix}$ generated by the increase in domestic goods;

λ_2 is the portion of the inflation of $\hat{P}_{Fix}$ generated by the domestic currency inflation of imported inputs;

λ_3 represents the portion of the inflation of $\hat{P}_{Fix}$ generated by the increase in the desired real mark-up.

δ: is the portion of inflation in the "Fix-Price" sector generated by the increase in the desired mark-up

Lag_p: is the time lag between a wage increase and the subsequent price increase;

Lag_w the time lag between a price increase and the subsequent wage increase;

Ψ: is the time lag of price increases relative to wage increases, expressed as a proportion of the total period between one price increase and the next.

π^E is the portion of the private sector's gross income effectively absorbed by profits.

π^F: is the target profit share of income by the capitalists

σ_1: is the share of the prices of the "Fix-Price" sector in the total value of the basket of goods that composes the general price index.

σ_2: is the share of the prices of the "Flex-Price" sector in the total value of the basket of goods that composes the general price index.

ω^E: is the share of the gross income of the private sector effectively absorbed by wages.

ω^W: is the target share of wages in income by the workers

"a": is the technical coefficient of inputs required to produce one unit of output (input/quantity produced)

"B": output per unit of labor (Q/L).

A: abreviation for $(1-\alpha)(1-\beta)$

b: is the real wage.

D: is the duration of the time interval during which the nominal wage remains constant.

e: is the nominal exchange rate.

F: is the share of gross private sector income effectively absorbed as import costs.

h: is a parameter that varies positively with the increase in the frequency of wage adjustments.

T: is the share of the private sector's gross income effectively absorbed by taxation.

A_i: is the quantity of input used in the production process.

L: is the quantity of labor units used in a production process.

Q: is the quantity of goods produced in the production process.

m: is the real mark-up .

n: is the nominal mark-up.

u: is the unit direct cost.

α_L: is the ratio of labor units per unit of product (L/Q);

α: is the parameter that represents the degree of flexibility of the average real wage.

β: is the degree of flexibility of the real mark-up in the "Fix-Price" sector.

θ: is the ratio of imported input units per unit of output (imported inputs/Q);

π: is the firm's gross profit

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INTRODUCTION

In recent years, interest in conflict inflation theories has revived. On one side, the idea that conflicting claims over distribution can explain inflation dynamics was incorporated within the mainstream literature (Lorenzoni and Werning, 2023a, 2023b; Blanchard and Bernanke, 2023; Ratner and Sim, 2022), motivated by the inflationary surge following the Covid-19 pandemic. On the other side, heterodox authors have debated the plausibility of the canonical conflict inflation model and its implied inflation dynamics (Hein, 2023; Lavoie, 2024; Hein and Häusler, 2024). Accordingly, Serrano, Summa, and Morlin (2024) proposed an interpretation of this debate regarding conflicting claims models, explaining inflation dynamics as the result of both conflicting claims over distribution and the frequencies of price and wage adjustments. This interpretation, however, was rather general and focused on the closed-economy case. Moreover, Serrano, Summa, and Morlin's (2024) objective was to contribute to the Post-Keynesian debate on the canonical conflict inflation model (Lavoie, 2022; Hein, 2023; Blecker and Setterfield, 2019) and hence they did not provide an extensive discussion of how the ideas of inflation as resulting from both conflict and frequency of price and wage adjustments appeared in the literature, mainly in the 1970s and 1980s.

In this context, the present study aims to advance the line of research proposed by Serrano, Summa, and Morlin (2024) in two ways: (i) to investigate how the perspective of inflation as the result of conflict and the frequency of price and wage adjustments has appeared in the literature; and (ii) to discuss the analytical role of the exchange rate (both nominal and real) in inflation dynamics, focusing on the interrelations between the exchange rate, relative prices, conflicting claims over distribution, and the frequency of price and wage adjustments. Starting with a critical review of the literature, we outline the theoretical elements that form the basis for analyzing inflation dynamics in open economies. Accordingly, this study seeks to assess the foundations of the models and, subsequently, the impact of exogenous variations in the nominal exchange rate on inflation dynamics.

The basic and unifying theoretical assumption of cost-push inflation models is that the prices of produced goods – or of a decisive share of them – are set by firms through the application of a mark-up over production costs.[1] It is important to note, however, that a general

[1] This perspective finds support in a tradition of empirical studies on prices, such as Hall and Hitch (1939), Hall (2018), Sylos-Labini (1979a, 1979b, 1982), Nordhaus, Godley (1972), and Coutts, Godley, Nordhaus (1978). The exact specifications of the appropriate concept of costs used to theoretically describe this price-setting process vary in the literature, as discussed in Lavoie (2022, pp. 164–172).

theory of prices is also a theory of functional income distribution, since prices remunerate wages, profit, and cover the inputs costs – that is, commodities produced by other firms. These input costs, in turn, include other prices, which themselves remunerate wages, profit, input costs, and so on.[2] Therefore, the general interdependence among the prices of all commodities across productive processes – which explains the relationship between prices and functional income distribution – implies that a consistent formal treatment of the general price-setting mechanism requires the simultaneous determination of prices throughout the economy.

Recognizing the inevitable relationship between prices and functional income distribution – as well as the general interdependence among all prices – is essential to coherently understanding the logical mechanisms underlying cost-push inflation models. These models seek to explain the determinants of generalized and persistent increases in prices and wages, which constitute the direct production costs across all productive processes.

Another fundamental feature of cost-push models is the inverse relationship between the real wage and the real mark-up, as revealed by price algebra.[3] When acknowledging this distributive antagonism between the real wage and the real mark-up, the persistence of the inflationary process described by price-wage spirals necessarily relates to the perspective of conflicting claims over distribution. Generalized price increases reduce the real wage (if nominal wages remain unchanged), while generalized increases in nominal wages reduce real mark-up (when prices remain constant). In the perspective of inflation as an expression of conflicting claims over distribution, the existence of a positive distributive incompatibility – defined as a positive gap between the real wage desired by workers and the real wage compatible with the real mark-up desired by firms – constitutes the fundamental determinant of the inflationary process. Within this perspective, the conflict between the real wage and the real mark-up emerges as the "driving force" (Lara Resende, 1979, p. 2)[4] behind autonomous increases in production costs through rising nominal wages and prices. In this context, inflation

[2] In line with the methodology of the System of National Accounts, the description of functional income distribution in inflation models distinguishes two income categories: (i) compensation of employees, referred to here as "wages," which includes labor income and mixed income earned by self-employed workers and liberal professionals; and (ii) gross operating surplus, referred to here as "profits," which encompasses all other forms of income not derived from labor. The "profits" category includes components other than net profits, such as interest, rents, royalties, and income from monopolies, among others. It is worth emphasizing that this dissertation does not focus on issues related to the influence of taxes on inflation. For a comprehensive analysis of the tax impacts on inflation, see Serrano, Aidar, and Bhering (2025).

[3] In addition to this demonstration through simple price algebra, the literature on the classical system of relative prices demonstrates an inverse relationship between the real wage and the profit rate, as shown in Sraffa (1960), Kurz and Salvadori (1995), Pasinetti (1977, pp. 84–89), and Petri (2021, pp. 91–147).

[4] Own translation.

– as a process of systematic increases in the general level of prices and nominal wages – becomes a phenomenon capable of dynamically altering income distribution.

Currently, the literature on cost-push inflation models characterized by price-wage spirals is dominated by authors who develop what has come to be known as the 'Conflicting Claims' models, which follow the approach initiated by Rowthorn (1977) and Okishio (1977), later formalized in a simplified version by Dutt (1987).[5] In this framework, distributive antagonism is modeled through equations that describe price-setting as a markup over direct unit costs. Given the existence of a positive distributive incompatibility, these models describe and formalize simultaneous adjustments of prices and nominal wages in which the magnitude of each adjustment depends on the extent of the distributive gap (between target real wages and effective real wage) and on the parameters that capture each class's bargaining power to enforce its desired remuneration. In order to incorporate open-economy elements, this class of models introduces the real exchange rate as an exogenous variable, thus adding an extra dimension to conflicting claims: the share of the external sector in total production costs. When the real exchange rate depreciates, this share rises, and the distributive incompatibility increases; conversely, when the real exchange rate appreciates, the share declines, and the incompatibility diminishes. Hence, the equilibrium real wage is determined by the magnitude of the distributive gap (influenced by the real exchange rate) and by the relative bargaining power of the classes, while the equilibrium inflation rate depends on the magnitude of distributive incompatibility and on the absolute values of the bargaining power parameters.

However, it is worth emphasizing that a variety of other cost-push inflation models – also highly influential in the literature – center their analyses on variables different from those found in the Conflicting Claims framework. Through an analytical investigation, this dissertation discusses, in addition to the Conflicting Claims models, three other groups of inflation models whose theoretical contributions collectively form a fundamental basis for the subsequent discussion of the role played by the exchange rate in inflationary dynamics: (I) structuralist

[5] Prominent examples of works grounded in this approach include Lavoie (2022), Blecker and Setterfield (2019), Hein (2023), Blecker (2011), Bastian and Setterfield (2020), Bastian, Charles, and Marie (2024), and Hein and Vogel (2007).

models;[6] (II) models based on the 'Inertial Inflation Theory';[7] and (III) models developed by the former Cambridge Economic Policy Group (CEPG).[8]

In structuralist models, the analytical focus lies on changes in relative prices triggered by exogenous variables which, through the logical mechanisms discussed in this dissertation, propagate as generalized price increases, thereby establishing the inflationary process. Within this perspective, inflation is fundamentally explained by the interplay between exogenous variations in relative price and conflicting claims over distribution. In open economies, nominal exchange rate depreciations play a decisive role as a causal mechanism of temporary relative price variations with distributive and inflationary consequences. This dissertation clarifies that nominal exchange rate depreciations change distributive variables only when they simultaneously produce real exchange rate depreciations. However, when the nominal exchange rate is assumed to be exogenous, the real exchange rate becomes endogenously determined as the outcome of the interaction among three highly correlated elements: nominal exchange rate variation, domestic inflation, and foreign inflation.

In inertialist models, in addition to the structuralist logic of the interaction between relative price changes and the generalization of price-wage spirals – understood as resulting from the inverse relationship between real wages and real mark-up – there is an analytical effort to detail the mechanisms through which nominal remunerations become indexed to past inflation. In these models, the basic explanation of inflation involves a combination of relative price changes and frequencies of adjustments (of wages, prices, and exchange rate), which emerge from generalized indexation mechanisms.[9] In the context of open economies, these models explore in greater depth the decoupling between nominal and real exchange rate dynamics. They also argue that there is an inverse relationship between real wages and the real

[6] Developed from seminal works focused on inflation in Latin America during the 20th century. Notable and representative examples of this group of models include: Noyola Vázquez (1956); Sunkel (1958); Olivera (1960, 1964, 1967); Pazos (1963, 1972); Pinto (1978a); Seers (1962); and Canavese (1982).

[7] Representative references within this group of models include: Modigliani and Padoa-Schioppa (1978); Lopes (1986); Modiano (1988); Pereira and Nakano (1987); and Ros (1989). Some of the authors associated with the inertialist approach once referred to themselves as 'neo-structuralists,' as highlighted by Serrano (2010, p. 404); Vernengo (2003, 2006). Connections between structuralist inflation theory and inertial inflation theory are also discussed, from a less analytical perspective, by Iasco-Pereira, Roncaglia, and Curado (2025).

[8] This theoretical approach is part of the broader Post-Keynesian tradition. However, as will be argued in this dissertation, the analytical treatment these models provide for describing time lags in price and wage adjustments justifies a distinction between the 'Conflicting Claims' framework and the CEPG framework. Influential works that develop this formalization include: Tarling and Wilkinson (1985); Coutts, Godley, and Nordhaus (1978); Godley and Cripps (1983); and Coutts, Tarling, and Wilkinson (1976).

[9] This dissertation discusses that inertialist models allow for different theoretical interpretations of the persistence of the inflationary process: either from the perspective of conflicting claims over distribution or from that of a 'pure inertia'.

exchange rate, with the latter being determined endogenously from the inflationary process itself.

In the CEPG models, distributive incompatibility is assumed to be the fundamental cause of inflation, and the process of price and wage increases stems from firms and workers attempting to achieve their respective real remuneration targets. The dynamics of the price-wage spiral in these models result from the combination of conflicting claims and the frequency (or periodicity) of price and wage adjustments. A distinguishing feature of this group of models lies in the explicit conceptual separation between nominal and real mark-up.[10] Based on this distinction, when prices are assumed to be set by applying a nominal mark-up over historical costs, significant analytical differences emerge in relation to the other three models.[11] It is important to emphasize that, although the CEPG models may be considered part of the broader Post-Keynesian 'Conflicting Claims' literature, their detailed specification of the time lags between wage and price adjustments leads to relevant differences in the implied inflation dynamics. For this reason, we treat them as a distinct group in order to highlight their major contributions.

In the present dissertation, the foundation for the critical literature review is Serrano, Summa, and Morlin (2024), who reinterpret the conflicting claims models by establishing connections with central variables found in other frameworks. In doing so, the authors combine conflicting claims over distribution with frequencies of adjustments as explanatory elements always present in the price-wage spiral. From this perspective, the parameters that capture the bargaining power of economic agents to enforce their targets for real wages and mark-ups translate into the frequencies of nominal wage and price adjustments over a given period. Considering also the explicit distinction between nominal and real mark-up, the frequencies of nominal wage and price adjustments become key determinants of both the equilibrium outcome of functional income distribution and the inflation level. Each adjustment – whether of prices or of nominal wages – produces a change in the real mark-up at the moment it occurs. Therefore, even if firms and workers hold specific targets for their real profit margins or real wages, they can only influence distribution through nominal adjustments, which are staggered in time.[12] Hence, the outcome of conflicting claims over distribution cannot be determined *a priori*. Within the theoretical and analytical framework that underlies this dissertation, the persistence

[10] As discussed by Serrano (2010) and Lavoie (2022, p. 169), and examined in detail by Tarling and Wilkinson (1985).
[11] The analytical role of the exchange rate in CEPG models is not discussed, because no relevant contributions related to open economy issues have been identified in this literature.
[12] In other words, nominal prices and wages do not adjust simultaneously.

of the inflationary process is thus explained by the coexistence of a positive distributive incompatibility with frequencies of adjustments.

Accordingly, building upon the analytical elements drawn from the critical literature review, the dissertation seeks to extend the analysis of the determinants of inflation dynamics to the context of an open economy. In this study, we introduce the nominal exchange rate as an exogenous variable and examine its inflationary and distributive impacts. Within this framework, the interaction between the frequency of nominal exchange rate adjustments, on one hand, and the frequency of nominal wage and price adjustments, on the other, determines the real exchange rate.[13] Following the logical sequence of the effects of nominal exchange rate variations on inflation dynamics, we argue that persistent inflation in an open economy necessarily reflects a nominal exchange rate-price-wage spiral. Furthermore, we contend that an increase in the frequency of nominal exchange rate depreciations leads to an increase in the frequencies of price and wage adjustments. In the final part of this dissertation, we briefly examine the analytical aspects of hyperinflation, understood as an accelerationist exchange rate-price-wage spiral, with no intrinsic limits to the growth rates of the adjustment frequencies of these variables.

The dissertation is organized into three chapters.

Chapter one presents an analytical examination of the four groups of inflation models aforementioned in closed economies. Each section explores the foundations of a given theory, presents a basic model for that theoretical approach, and assesses its contributions and problems. The chapter also investigates how each model connects with the theoretical perspective of inflation as the expression of both conflicting claims over distribution and frequencies of adjustments. Section one discusses structuralist theory. Section two examines inertialist theory. Section three is divided into two parts: Part A assesses the Conflicting Claims Theory, and Part B examines the CEPG framework. The final section provides a concluding synthesis of the main analytical contributions drawn from the critical literature review, arguing that the inflationary process should be analyzed through the integration of four key elements: (i) exogenous changes in relative price; (ii) conflicting claims over distribution; (iii) frequencies of prices and wages adjustments; and (iv) inertia. The investigation developed in this chapter makes it clear that, among these four elements, conflict and the frequencies of adjustments are the truly fundamental components in explaining inflation. Exogenous changes in relative prices are relevant because they necessarily entail exogenous variations in the terms of conflicting

[13] The real exchange rate is treated as an endogenous outcome of the inflationary process itself, not as an exogenous variable in the model.

claims over distribution, while inertia emerges as a direct consequence of conflict and the frequencies of adjustments.

Chapter two extends the analysis to the open economy context and evaluates the analytical role of the exchange rate (nominal and real) within three of the four models from the previous chapter. Section one introduces the discussion. Section two investigates the role of the exchange rate in structuralist models. Section three examines the exchange rate in inertialist models. Section four discusses the exchange rate in Conflicting Claims models. Section five synthesizes the main theoretical contributions discussed throughout the chapter to clarify the role played by the exchange rate in inflation dynamics, based on the critical literature review.

Chapter three argues for the existence of a nominal exchange rate-price-wage spiral in open economies and presents the logic underlying this dynamic. In addition to grounding the analysis in the three models discussed in Chapter two, the discussion draws on the extension of the classical system of relative prices to open economies, as developed by recent studies.[14] The first section is introductory. Section two explores the exchange rate's impact on relative prices. Section three analyzes how relative price changes affect conflicting claims in an inflationary context. Section four outlines the mechanisms through which variations in the frequency of nominal exchange rate adjustments influence the frequency of price and wage adjustments. Section five examines the analytical aspects of hyperinflation within the framework developed throughout the dissertation.

Lastly, a few final pages are dedicated to concluding remarks.

[14] Among these, important contributions include Steedman (2001), Machado (2017, 2022), Morlin (2023), Dvoskin, Feldman, and Montes-Rojas (2024), Dvoskin, Feldman, and Garegnani (2024), and Alvarez (2024).

CHAPTER 1: FOUR THEORETICAL MODELS OF INFLATION IN CLOSED ECONOMIES

This chapter critically examines the analytical foundations of cost-push inflation models based on price-wage spirals in closed economies. The discussion focuses on four groups of theoretical models: structuralist models, inertial inflation theory models, conflicting claims models, and CEPG models. Throughout the chapter, we explore the main contributions of each group to answer a set of key questions: Do these models interpret inflation as a dynamic expression of conflicting claims over distribution? Do they view it merely as a result of the frequency of price and wage adjustments? Do they connect both aspects – conflict and frequency of adjustments – in an integrated manner? Do they explain inflation exclusively as a consequence of exogenous relative price shocks? This analysis aims to clarify these questions. At the end, we summarize the main analytical contributions identified in the literature review and argue that the price-wage spiral in a closed economy context results from the interaction of four core analytical elements: (i) exogenous variations in relative prices, (ii) conflicting claims over distribution, (iii) frequency of price and wage adjustments, and (iv) inertia (which is explainable by conflicting claims and frequencies of adjustments).

It is important to highlight that, although we classify works and authors into four distinct groups, we recognize theoretical and formal differences within each group – as well as individual approaches to the subject – that sometimes require detailed examination of specific divergent elements.[15] Therefore, each section focuses on discussing the basic and fundamental logical elements that form a consensus within each literature. We address heterogeneities only when necessary.

1.1. THE STRUCTURALIST INFLATION THEORY

In this dissertation, the structuralist theory of inflation refers to a set of works developed largely as original contributions addressing the theme of persistence of high inflation in Latin America during the 20th century. Key references in this literature include: Noyola Vázquez

[15] To illustrate the analytical differences within a single group, Serrano (1986) identifies at least five distinct meanings attributed to the idea of the "fundamentally inertial nature" of inflation, as understood in Brazilian literature during the 1980s. Each of these five interpretations relies on specific hypotheses and distinct conceptual frameworks (SERRANO, 1986, p. 3). In summary, the author lists: (i) a version consistent with the rational expectations approach; (ii) a version based on adaptive expectations; (iii) a version grounded in the notion that inflationary inertia is purely institutional; (iv) a version that explains inflation through rigidities in relative wages; and (v) a version that views inflation as an expression of conflicting claims over distribution.

(1956); Sunkel (1958); Pinto (1978a, 1978b); Olivera (1960, 1964, 1967); Kaldor (1976); Pazos (1963, 1972, 1977); Seers (1962); Canavese (1982); Malan and Wells (1982); Bastos (2001, 2002).

Although no single model fully represents structuralist inflation theory, these references share core assumptions and concepts that converge into a general explanation of the inflationary process. Based on this literature, we develop an analytical core and build a stylized model that reflects the structuralist logic of inflation. The core of the structuralist theory consists of the following ideas:

i) Inflation arises from real imbalances that drive general price increases.

ii) Prices are determined across two distinct sectors: (a) a sector with “flexible” prices, and (b) a sector with “rigid” prices – not responsive to demand variations, following some proportionality more tied to production costs.[16]

iii) Productive processes across sectors are interdependent, which means that prices of both sectors are also interdependent.

iv) Persistent inflation results from two analytical elements: (a) inflationary pressures that change relative prices; (b) propagation mechanisms that drive price and wage adjustments in response to these changes.

v) Internal inflationary pressure stems from the inability of a sector to expand supply in line with demand growth for its own products.

vi) Propagation mechanisms reflect a dynamic of price and wage adjustments explained by conflicting claims over distribution.

vii) Nominal wages and prices are downward rigid.

viii) The inflationary impact of relative price changes depends on (a) upward price flexibility in the “Flex-Price” sector and (b) overall flexibility in relative prices.[17]

ix) Inflation caused by these pressures can be understood as a multiplier effect of an exogenous change in relative price caused by the inflationary pressure.[18]

With this analytical core in mind, we present a stylized closed-economy model based on theoretical developments from the selected works.[19] We then assess how this theory relates to

[16] This framework follows a tradition of models that examine short-run supply responses to demand, distinguishing between ‘Fix-Price’ and ‘Flex-Price’ markets, as discussed by Hicks (1974) and Serrano (1988).

[17] The inflation level generated by a shock depends on how relative prices respond to the change from their pre-shock equilibrium values. The less flexible relative prices are, the stronger the inflation propagation mechanisms become.

[18] Olivera (1967), Canavese (1982).

[19] These references lay out the logical foundations behind all key variables of the inflationary process within structuralist theory: the disaggregation of the economy into two sectors; the price-setting mechanisms in each

perspective of inflation as the expression of both conflicting claims and frequency of adjustment. Since most of the referenced literature does not use formal mathematical modeling,[20] the analysis here combines the exposition of the logical connections among the core elements with the formalization of some key variables within this theoretical framework.

1.1.1. Basic Model

The starting point of structuralist theory is the rejection of the notion that inflation stems from excess aggregate demand. Grounded in pioneering works by Noyola Vázquez (1956), Sunkel (1958), and Pinto (1978a, 1978b), structuralist theory argues that this type of explanations reveals only the surface of inflation and fail to:

> Understand the constant inflationary pressures that affected many of our countries, going beyond the obvious or the simplistic assumption that the problem lies in 'misbehavior' by financial authorities or those who oversee them. (Pinto, 1978a, p. 20).[21]

Since early contributions also addressed development issues in Latin American economies, structuralist authors integrated the themes of inflation and growth. This literature reached a consensus that the “underlying sources of inflation in less developed countries are found in the fundamental problems of economic development and in the structural features of their productive systems" (Sunkel, 1958, p. 571).[22] Accordingly, understanding such “structural features” requires a precise description of the productive structure. Noyola Vázquez (1956, p. 163) identified three sources of imbalance in these features: (i) structural elements related to the distribution of production and population across productive sectors; (ii) dynamic elements, such as sectoral and aggregate growth rate differentials; (iii) institutional elements, including private sector organization, firms’ market power, price-setting mechanisms, labor bargaining power, and state intervention.

A central aspect of the structuralist explanation is the explicit separation of the price-setting process into two sectors: (i) a “Flex-Price” sector (usually associated to agriculture), and (ii) a “Fix-Price” sector, rigid in relation to demand (typically associated to industry).[23] This literature usually offers no effort to provide a general theoretical explanation of the precise

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sector; inflationary pressures; the propagation mechanisms of inflationary shocks; and analytical insights into the relationship between inflation and the functional income distribution.

[20] Exceptions include Seers (1962), Olivera (1967), and Canavese (1982), who provide a mathematical description of their arguments.

[21] Own translation.

[22] Own translation.

[23] Kaldor (1976) associates the primary sector with “Flex-Price” commodities and the secondary and tertiary sectors with commodities whose prices are 'rigid' in response to demand changes.

foundation for this separation;[24] however, it can be justified by assuming two distinct short-run supply adjustment mechanisms, as discussed by Hicks (1974, pp. 22-30) and Serrano (1988, pp. 63-65).

According to Serrano (1988, pp. 63-65), in “Fix-Price” markets, “producers set prices based on normal costs plus a desired mark-up, and the short-run adjustment between supply and demand occurs through variations in inventories (or in capacity utilization)”.[25] In contrast, there are 'Flex-Price' markets in which:

> producers do not operate with high levels of inventories (or idle capacity), firms simply produce and offer for sale the quantity they consider adequate (that is: which, given the expected level of demand, they believe will achieve the desired price and mark-up), and allow the adjustment between supply and demand to occur through prices. (Serrano, 1988, pp. 63–64).[26]

However, even in “Flex-Price” markets, long run prices are not determined by demand, because a supply adjustment occurs, generating a mechanism through which the profit rates of both sectors gravitate toward the 'normal' level.[27] Recognizing this sectoral distinction, the structuralist theory assumes interdependence between sectors, as discussed by Kaldor (1976), Malan and Wells (1982), and implicitly assumed throughout the literature. Accordingly, “Flex-Price” goods enter the production costs of “Fix-Price” goods and vice versa.[28] As Malan and Wells (1982, p. 8) state:

> Primary prices enter both directly into the cost function of industrial goods (as raw material inputs) and indirectly through their influence on wages (food being a crucial element in the reproduction costs of the urban labour force in most developing countries). Industry, in its turn, provides inputs to primary production. (Malan; Wells, 1982, p. 8).

Given the recognition of such price interdependence, it is essential to emphasize that the analytical separation of the two sectors plays a decisive role in the model: price increases in the “Flex-Price” sector enter the cost structure of the “Fix-Price” sector and, as a result, trigger

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[24] For a possible (partial) foundation, see Serrano (2001, pp. 11–18) for a comprehensive analysis of the relationship between the Latin American Structuralist theory and the notion of ‘forced savings’. Some elements discussed by Serrano (2001) are also present in Bastos and Oliveira (2020).

[25] Own translation.

[26] Own translation.

[27] There is a logic of long-run supply adjustment in the case of the “Flex-Price” sector: firms are approximately price takers, and market prices serve as signals for supply-side adjustments to be carried out in the long run. When the relationship between effective demand and supply in this sector persistently generates market prices above the supply price (defined as the minimum price that covers wages, profit rate, and rents at their normal levels, established through social, historical, and institutional interactions), firms invest in productive capacity to increase supply in these sectors. As this supply adjustment process unfolds through competitive dynamics – considered in the classical sense – market prices tend to gravitate around supply prices in the long run. In this framework, supply prices represent equilibrium prices, and market prices gravitate around this equilibrium – without necessarily equalizing. When the interaction between effective demand and supply leads to a market price persistently below the supply price, the adjustment process reverses, and firms respond by reducing the quantity brought to market in subsequent periods.

[28] This literature does not provide a mathematical formalization of the general interdependence among all prices of all commodities, as in Sraffa (1960). However, it presents an implicit or explicit argument that acknowledges such complementarity between sectors.

generalized price increases. Through this mechanism, exogenous variables can explain price hikes in the “Flex-Price” sector and generate broader inflationary impulses – since cost increases in the “Fix-Price” sector are passed on to prices with some time lag.

Considering these two distinct price-setting processes, structuralist theory advances the explanation of persistent inflationary processes through the interaction of two elements: (a) “inflationary pressures”, which translate into changes in relative prices; and (b) propagation mechanisms, which consist of a dynamic of price and wage adjustments in response to price changes.

From this perspective, inflationary pressures stem from the systematic inability to adjust supply in specific productive sectors – typically, and often without further justification, supply in the agricultural sector is considered rigid, which leads to an association between the “Flex-Price” sector and agriculture. In this context, differences between the growth rate of demand for agricultural goods and the growth rate of production in this sector cause price increases for this group of goods. It is important to emphasize that the price increases resulting from such sectoral mismatches between supply and demand are initially limited to the goods in the “Flex-Price” sector, thus generating a change in relative prices ($\uparrow \frac{P_{Flex}}{P_{Fix}}$).[29]

Thus, considering the logic of inflationary pressures reflected in price changes within specific productive sectors, the emergence of a persistent and generalized inflationary process requires the coexistence of a second explanatory element of price variation: the “propagation mechanisms”. The basic idea of “propagation mechanisms” is that price increases in the “Flex-Price” sector are transmitted as price increases in the “Fix-Price” sector, increases in nominal wages, and increases in other nominal remunerations (such as interest, rents, etc.). Therefore, the essential idea is that pressures which are sectoral, even if “structural”, turn into a generalized inflationary process. There is a logic that underlies these adjustments: on the one hand, nominal wages increase in response to the reduction in real wages caused by inflation in the “Flex-Price” sector; on the other hand, prices in the “Fix-Price” sector rise because production costs increase with higher nominal wages. Finally, prices associated with other forms of asset income also rise to offset the losses in real returns caused by the inflationary process. In this sense, the propagation mechanisms “transfer the original structural inflationary pressure” (Canavese, 1982, p. 524) and generalize price increases. It is worth noting that propagation mechanisms form a dynamic of conflicting claims over distribution in which different income-appropriating classes compete for larger shares of income while resisting losses in real remuneration. This

[29] P_{Flex} is the average price index of 'Flex-Price' sector, and P_{Fix} is the average price index of the 'Fix-Price' sector.

understanding of propagation mechanisms, aligned with the idea of conflicting claims over distribution, was present in Sunkel (1958, p. 575), who views it as the result of the inability to put an end to "economic interest clashes or struggles".[30]

Note, therefore, that the structuralist explanation of inflation combines two fundamental elements: relative price variation and conflicting claims over distribution. Changes in relative prices provide the initial impulse for the generalization of inflation through the logic of conflicting claims. Thus, considering the logic of these two analytical elements, we rely on the formalization of these arguments developed by Olivera (1967) and Canavese (1982) to present a concise version of the formalized structuralist model.

Let: P is the general price index; P_{Flex} is the average price index of "Flex-Price" sector; P_{Fix} is the average price index of the "Fix-Price" sector; P_R is the relative price index of a basket of "Flex-Price" goods expressed in units of a basket of "Fix-Price" goods (i.e. P_{Flex}/P_{Fix}); W is the average nominal wage; t indicates the time period.

An inflationary pressure initially generates a change in relative prices, such that "Flex-Prices" rise more than "Fix-Prices", temporarily. Given the definition of $P_R(P_{Flex}/P_{Fix})$, it is possible to describe the variation in relative prices in a dynamic context, applying logarithmic transformations and approximations, as follows:

$$\hat{P}_R = \hat{P}_{Flex,t} - \hat{P}_{Fix,t} \qquad (1.1.1)$$ [31]

To formalize the structuralist explanation of propagation mechanisms, we begin with the assumption that nominal wages and "Fix-Prices" are downward rigid, such that:

$$\widehat{W_t} \geq 0 \qquad (1.1.2)$$

$$\hat{P}_{Fix,t} \geq 0 \qquad (1.1.3)$$

Given the inflationary effect in the "Flex-Price" sector, which reduces the real wage, this process induces a response from workers seeking to resist real wage losses by pushing for higher nominal wages. Let α denote a parameter representing the degree of flexibility of the average real wage. The change in the nominal wage can then be expressed as:

$$\widehat{W_t} = (1 - \alpha)\hat{P}_{Flex,t-1} \qquad (1.1.4)$$

$$0 \leq \alpha \leq 1$$

[30] Own translation.

[31] The "^" denote rates of change. In the model, the variation in relative prices ($\hat{P}_R$) is treated as exogenous and explained by inflationary pressures. In this sense, a given configuration of relative prices generated by the assumed inflationary pressure (which determines the $\hat{P}_R$ used in the model) constitutes an equilibrium that, in this closed-economy framework, can only be reversed by eliminating the sectoral imbalance between supply and demand. Therefore, $\hat{P}_R$ remains as constant and exogenous throughout all periods considered in the model.

Equation (1.1.4) indicates that, for a given degree of real wage flexibility, nominal wages increase with some delay in response to the inflation observed in the period prior to the wage adjustment, during which the real wage declined.

On the other hand, "Fix-Price" sector increase their prices to compensate for the reduction in mark-ups caused by rising production costs – which, in the structuralist explanation, result from higher nominal wages increasing labor costs. Let β denote the degree of flexibility of the real mark-up in the "Fix-Price" sector. We can formalize price increases in this sector as a response to wage increases as follows:

$$\hat{P}_{Fix,t} = (1-\beta)\widehat{W_t} \qquad (1.1.5)$$[32]

$$0 \leq \beta \leq 1$$

Equation (1.1.5) indicates that, for a given degree of flexibility of the real mark-up, prices in the "Fix-Price" sector adjust in response to increases in current costs driven by wages. Note that with this type of formalization – based on Olivera (1967) and Canavese (1982) – prices are assumed to adjust without time lag relative to cost increases. This implicitly means that prices in the "Fix-Price" sector are set as a (flexible) real mark-up over replacement cost[33] – even though the parameter β allows for a reduction in the real mark-up due to inflation. However, it is worth noting that this specification of price determination in the "Fix-Price" sector is not homogeneous across the literature.[34]

If the underlying "inflationary pressure" persists, the initial change in relative prices does not disappear after the "Fix-Price" sector's adjustment. In this case, once "Fix-Price" firms raise their prices, the relative prices become misaligned and incompatible with the inflationary pressure that shifted the initial configuration (and continues to prevail). To restore the new configuration of relative prices consistent with the existing "pressure", prices in the "Flex-Price" sector inevitably rise again. This process repeats as long as the inflationary pressure persists, generating new rounds of "Flex-Price" increases after each "Fix-Price" adjustment. Each of these rounds introduces shocks to the inflationary dynamics, and as long as both the

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[32] It is important to highlight that Olivera (1967) and Canavese (1982) implicitly assume that price increases respond instantaneously to rises in nominal wages, whereas nominal wages adjust to price increases with a time lag.

[33] Replacement cost is defined as the cost assessed by its various components at current prices, as discussed by Serrano (2010). To ensure analytical clarity and consistency, it is essential to establish an explicit conceptual distinction between replacement cost and historical cost. Historical cost is defined as 'the cost base equal to the sum of costs of different inputs, the cost of each category calculated at time of purchase' (Nordhaus & Godley, 1972, pp. 854–855).

[34] Sunkel (1958, p. 589), for example, explicitly assumes the existence of a time lag in price adjustments in response to cost increases.

new configuration of relative prices and the adjustments in nominal wages and in the prices of the "Fix-Price" sector persist, such shocks will continue to occur.

Let "A" represent $(1-\alpha)(1-\beta)$. We can then return to equations (1.1.1), (1.1.4), and (1.1.5) to rewrite the subsequent rounds of price increases in "Flex-Price" goods as:

$$\hat{P}_{Flex,t} = \hat{P}_R + A\hat{P}_{Flex,t-1} \qquad (1.1.6)$$

Following the same logic, and through algebraic manipulations, we can rewrite the inflation of "Fix-Price" goods as:

$$\hat{P}_{Fix,t} = A\hat{P}_R + A\hat{P}_{Fix,t-1} \qquad (1.1.7)$$

Finally, given the dynamics described in both sectors ("Fix-Price" and "Flex-Price"), the disaggregated general price index, in turn, can be represented as:

$$P = p_{Fix}^{\sigma_1} p_{Flex}^{\sigma_2} \qquad (1.1.8)$$

$$\sigma_1 + \sigma_2 = 1$$

σ_1 and σ_2 represent, respectively, the shares of "Fix-Price" and "Flex-Price" goods in the total value of the basket that composes the general price index. Equation (1.1.8), expressed in terms of (linearized) rate of change, becomes:

$$\hat{P} = \sigma_1\hat{P}_{Fix} + \sigma_2\hat{P}_{Flex} \qquad (1.1.9)$$

$$\sigma_1 + \sigma_2 = 1$$

Note that, based on equations (1.1.8) and (1.1.9), it becomes immediately clear that the inflation rate is given by a weighted average of the inflation rates in the two sectors.

Finally, considering the formalization of the dynamic interaction between inflationary pressures and propagation mechanisms – summarized in equations (1.1.1) through (1.1.9) – it is necessary to examine the roles of the degrees of flexibility of real mark-up and real wage in understanding the impact of an inflationary pressure on the overall inflation rate. Since nominal wage and "Fix-Price" adjustments are negative functions of the flexibility of the real wage and real mark-up, it becomes evident that the higher the flexibility of these real variables, the lower will be the growth rates of prices and nominal wages in response to the relative price variation generated by an inflationary pressure. Conversely, the lower the degree of flexibility of these real variables, the greater will be the inflationary impact of an initial movement in relative prices. Thus, according to the theoretical framework developed so far, the more resistant real remunerations (wages and mark-ups) are, the higher will be the resulting inflation rate following a shift in relative price equilibrium caused by inflationary pressures.

To formalize this logical relationship between the degree of flexibility of real remunerations[35] and the inflation rate resulting from inflationary pressures, it is useful to follow the approach of Olivera (1967) and Canavese (1982), assessing three hypothetical cases related to the parameter values that reflect the flexibility of the real wage and real mark-up.

First, we consider an extreme analytical case in which the degrees of flexibility of the real wage and the real mark-up are total (or, analogously, the degrees of resistance are null), such that nominal wages and prices in the "Fix-Price" sector do not respond to inflationary impulses generated by changes in relative prices. Formally, this analytical case can be represented as follows:

$$A = 0 \tag{1.1.10}$$

As a consequence, the inflation rates in each sector would be:

$$\hat{P}_{Flex,t} = \hat{P}_R \tag{1.1.11}$$

$$\hat{P}_{Fix,t} = 0 \tag{1.1.12}$$

It is important to note that, in this case, a basic result emerges: the adjustment of relative prices is immediate and, by not triggering revisions in any of the other prices in the economy, it generates the lowest possible inflation level for a given inflationary pressure. Therefore, in this case, an inflationary pressure generates only temporary inflation, which disappears exactly because the complete adjustment of relative prices occurs immediately and does not induce adjustments in "Fix-Price" sector prices or in nominal wages. In this scenario, there is only a single shock stemming from the inflationary pressure, and the absence of responses in nominal wages and "Fix-Price" sector prices explains the lack of further shocks.

On the other hand, consider the opposite extreme analytical case. In this scenario, the degrees of flexibility of the average real wage and the real mark-up (in the Fix-Price sector) are null – meaning there is total resistance of real remunerations. In such a case, any increase in Flex-Price prices is fully transmitted to Fix-Price prices and nominal wages, both rising at the same rate. Within the structuralist framework (in a closed economy), inflationary pressures generate a shift in the relative price equilibrium that can only be reversed by adjusting the growth rate of supply relative to demand in the Flex-Price sector – i.e., eliminating the structural pressure itself. However, under the assumption of full rigidity of real wages and real mark-up,

[35] Note that the concept of degree of flexibility is, by definition, the opposite of the degree of rigidity (or resistance) of real remunerations. Logically, these are two distinct ways of expressing the same concept. In Serrano, Summa, Morlin (2024) and in the inertialist literature, this idea is approached from the perspective of the degree of resistance.

inflation cannot effectively establish a change in relative prices. In this case, inflation dynamics becomes accelerationist, and the effect of structural pressures reaches its maximum intensity.

Formally, this analytical case corresponds to a situation in which:

$$A = 1 \tag{1.1.13}$$

As a consequence, the growth rates of prices in each sector would be acceleraccionist, since:

$$\hat{P}_{Flex,t} = t\hat{P}_R + \hat{P}_{Flex,0} \tag{1.1.14}$$

$$\hat{P}_{Fix,t} = t\hat{P}_R + \hat{P}_{Fix,0} \tag{1.1.15}$$

However, there is a dynamic of price and wage adjustments that describes an intermediate case, more representative of reality: real wages and mark-ups (in the Fix-Price sector) exhibit some degree of flexibility and cannot fully resist the losses caused by systematic inflation. Under this configuration, the resulting inflation level is higher than in the first case but lower than in the second. Formally, this analytical case corresponds to a situation in which:

$$0 < A < 1 \tag{1.1.16}$$

The solution to equation (1.1.6) in this case yields:

$$\hat{P}_{Flex,t} = A^t \hat{P}_{Flex,0} + (\frac{1-A^t}{1-A})\hat{P}_R \tag{1.1.17}$$

Dynamically, the inflation rate in the "Flex-Price" sector converges to an equilibrium in which:

$$\hat{P}_{Flex} = \hat{P}_R(\frac{1}{1-A}) \tag{1.1.18}$$

On the other hand, the solution to equation (1.1.7) in this case yields:

$$\hat{P}_{Fix,t} = A^t \hat{P}_{Fix,0} + \hat{P}_R(\frac{(1-A^t)A}{1-A}) \tag{1.1.19}$$

And thus, the inflation rate in the "Fix-Price" sector converges to an equilibrium in which:

$$\hat{P}_{Fix} = \hat{P}_R(\frac{A}{1-A}) \tag{1.1.20}$$

Finally, it is essential to note that equations (1.1.18) and (1.1.20) summarize the two central analytical elements of structuralist theory. The term $\widehat{P_R}$ represents the change in relative prices generated by inflationary pressures, while the terms $(\frac{1}{1-A})$ and $(\frac{A}{1-A})$ represent the propagation mechanisms of these pressures. It is worth noting that, by substituting (1.1.18) and (1.1.20) into equation (1.1.9), we can describe the equilibrium aggregate inflation level as:

$$\hat{P} = \sigma_1[\widehat{P_R}\left(\frac{A}{1-A}\right)] + \sigma_2[\widehat{P_R}\left(\frac{1}{1-A}\right)] \tag{1.1.21}$$

Equation (1.1.21) describes the equilibrium inflation level as a multiplier of the inflationary pressure (change in relative prices), which grows larger as the parameter “A” increases.

1.1.2. Contributions and Problems of Structuralist Inflation Models

Considering the theory and logic underlying the set of analytical elements in the structuralist inflation model, it becomes possible to assess the contributions and problems of this approach.

a. Analytical Contributions

Among the analytical contributions, the first notable element is the explanation of relative price variations based on the recognition of productive sectors with distinct short-run price-setting processes. This distinction allows the mechanism of “inflationary pressures” to serve as a causal description of impulses affecting the inflation level. This separation of the economy into two sectors enables observing the inflationary impact of exogenous variables that cause price changes within a specific group of goods.

However, the most relevant theoretical contribution of this theory is the articulation between changes in relative prices and the dynamics of price and wage adjustments driven by conflicting claims over distribution. The integration of these two elements – which are usually treated separately in other approaches – constitutes the distinctive feature of the structuralist model. It is worth noting that, by formalizing this dynamic with focus on real remunerations – real wages and real mark-ups – these models describe a convergence process in which inflation moves toward an equilibrium level, determined by the degree of resistance of such real variables. Thus, even without deepening the analysis of the relationship between inflation and the functional income distribution, this theory opens the way for clarifying this issue.

Furthermore, the formal description of the equilibrium inflation rate as a positive function of relative price variation and rigidity of real remunerations enables the understanding of some elements that reduce, accelerate, or stabilize inflation levels over time. In the model, the existence of “propagation mechanisms” ensures that specific configurations of relative price equilibrium correspond to specific inflation rates.

Finally, it is important to emphasize that, in the model, the persistence of the inflationary process requires the simultaneous presence of relative price variation and conflicting claims over distribution. In this literature, the causal element of inflation is the change in relative prices, while subsequent adjustments are spontaneous and uncoordinated reactions by various classes of agents. From an analytical standpoint, this implies that eliminating inflation requires reversing the relative price movement that initially triggered the inflationary process.

b. Analytical Problems

Among the problems of the presented model, it is necessary to first highlight the extreme simplification in the disaggregation of the overall price index. The choice to reduce the description of the "Flex-Price" sector solely to the agricultural sector ends up excluding from the analysis a wide variety of basic commodities within the primary sector, whose price behavior shows some similarity in terms of flexibility (such as fuels, minerals, energy, and some other commodities).[36]

Another point worth emphasizing is the imprecise specification of the determinants of the price growth trajectories in the "Fix-Price" sector and nominal wages over time. Price and wage adjustments are formalized as functions of parameters capturing the degree of flexibility of real remunerations, without detailed specification of the nominal adjustment dynamics in terms of other nominal variables. In this case, adjustments depend on real remunerations through well-defined parameters that pre-determine the distributive limits of the inflationary process itself. The absence of detailed consideration of the time lags in nominal variable adjustments renders the description of the process dynamics imprecise.

Finally, it is necessary to point out that structuralist theory does not deepen the analysis of the relationship between inflation and the functional income distribution. The parameters capturing the degrees of flexibility of real remunerations inherently carry important distributive meanings but are not discussed in detail. In this regard, as introduced in the model, these parameters implicitly pre-determine the distributive outcome of the model used to specify the dynamics of price ("Fix-Price" sector) and wage adjustments.

1.1.3. Conflicting Claims over Distribution, Frequencies of Adjustments, and the Structuralist Model

[36] It also analytically excludes the possibility of influences from government-administered prices.

Regarding the theory and logic discussed in this chapter, it becomes necessary to examine the articulation of the structuralist model with the approach that interprets inflation as the simultaneous expression of conflicting claims over distribution and the frequencies of nominal price and wage adjustments.

First, note that structuralist theory maintains a peculiar relationship with the explanation of inflation through conflicting claims over distribution. The basic causal mechanism of inflation is the "inflationary pressure" that changes relative prices. In this sense, a defining feature of this literature is the explicit rejection, as a premise, of the notion that conflicting claims over distribution constitutes the fundamental cause of inflation. Given the separation between the two analytical categories (inflationary pressures and propagation mechanisms), this literature considers that the dynamic of price and wage adjustments driven by conflicting claims merely generalizes an initial inflationary cause – that is, these authors implicitly assume a model without conflicting claims under normal conditions, which is disturbed by shocks that alter relative prices. This perspective is made explicit in Pinto (1978a):

> Assuming that it is uncommon for an "autonomous" increase in incomes or remunerations to be the original trigger or precursor of inflationary phenomena, it seems more relevant not to focus on this initial situation but rather to distinguish two closely related main aspects. (Pinto, 1979a, p. 29)[37]

Therefore, from this perspective, conflicting claims only amplifies the inflationary impacts generated by changes in relative prices. Thus, ending inflation requires reversing the initial movement of the relative price vector through inflation itself – which presupposes the prior elimination of the "inflationary pressure"

It is crucial to note that, within this logic, temporary exogenous shocks cannot generate a persistent inflationary process because the initial relative price change caused by rising prices in the "Flex-Price" sector ($\uparrow \frac{P_{Flex}}{P_{Fix}}$) leads to increases in nominal wages and prices in the "Fix-Price" sector. Consequently, after the temporary original shock, relative prices tend to return, at least partially, to a configuration closer to that before the shock (i.e., the subsequent inflationary process itself generates a later $\downarrow \frac{P_{Flex}}{P_{Fix}}$ if the shock is temporary). In this case, relative prices would revert to a configuration closer to the initial "pre-shock" level, albeit at a higher absolute price level. Therefore, the persistence of the inflationary process requires continuous inflationary impulses in the "Flex-Price" sector, justified by a shift in the equilibrium of the relative price vector corresponding to the situation caused by the inflationary pressure.

[37] Own translation.

Given the functions describing price and wage adjustments, it immediately becomes clear that the frequencies of nominal wage and price adjustments do not occupy a relevant variable role within the model. As previously discussed, adjustments are formalized through exogenous parameters representing the "degrees of flexibility" of the real wage and the real mark-up. Since nominal price and wage adjustments are described only as functions of these variables, the relationships between adjustment frequencies and inflation itself remain imprecise. Understanding this relationship would require formalizing nominal variable adjustments as functions of other nominal variables and of the inflation level itself.[38]

It follows, therefore, that structuralist theory describes inflation as a phenomenon resulting from two basic explanatory factors that must coexist: changes in relative prices and conflicting claims over distribution. Inflationary pressures drive changes in relative prices, which in turn cause inflation. Propagation mechanisms – such as wage and price adjustments – then generalize and amplify the inflationary effects of those relative price changes.

1.2. THE INERTIAL INFLATION THEORY

Since the theory of inertial inflation comprises several versions – sometimes divergent and irreconcilable[39] – this dissertation must narrow the wide spectrum of theoretical perspectives present in the literature. To ensure internal consistency, this section discusses cost-push inflation models described through price-wage spirals focusing exclusively on versions that, in some way, acknowledge the inverse relationship between the real wage and the real mark-up. For that reason, we exclude neoclassical versions of inertialist models based on rational or adaptive expectations (Serrano, 1986, pp. 4–6).

This section presents a stylized model that incorporates the theoretical elements commonly found in the non-neoclassical strand of this literature.[40] Theoretical elements and specific features of models that diverge from the more consensual positions within this group

[38] On this topic, the models of the 'Inertial Inflation Theory' would develop a more detailed formalization of the mechanisms by which nominal variables become indexed to the inflationary process over time, and the frequencies (or periodicities) of adjustments would become central to understanding the inflationary process.

[39] As argued in Serrano (1986), the different versions are divergent and irreconcilable because they are based on concepts and logics of interaction between variables that are distinct from one another. In such incompatible frameworks, the literature based on "inertial inflation" perspective (in the sense of the recognition of the influence of past inflation on future inflation) mix explanations whose foundations are theoretical arguments that do not connect with each other.

[40] Examples of neoclassical versions of inertial inflation models are Simonsen (1983, 1986, 1988a, 1988b); Fischer (1986); John Taylor (1979).

are considered as alternatives to the standard model presented here.[41] After presenting both the consensual and contrasting elements, we critically assess the analytical roles of conflicting claims over distribution, the frequency of price and wage adjustments, and exogenous shocks to relative prices in shaping the model's outcomes.

From the literature of this group of models, we extract a notable set of foundational theoretical elements – the analytical core. The key references underlying the theoretical perspective discussed in this section include: Modigliani and Padoa-Schioppa (1978); Lara Resende (1979); Lara Resende and Lopes (1979); Lara Resende and Arida (1984); Arida (1982); Bacha and Lopes (1983); Modiano (1983, 1984, 1985a, 1985b); Lopes and Modiano (1982); Modiano and Lopes (1985); Lopes (1976, 1982, 1983, 1984a, 1984b, 1986, 1989); Pereira and Nakano (1987); Ros (1989).[42]

The analytical core of these models integrates the following ideas:

(i) The relationship between prices and the functional income distribution is expressed through an equation that reflects a basic accounting truism and describes commodity prices as a mark-up over unit direct cost.

(ii) The mark-up desired by firms does not respond to changes in demand.

(iii) There is an inverse relationship between the real mark-up and the real wage.

(iv) Nominal wage adjustments follow some scheme of indexation to the accumulated inflation of the previous period.[43]

(v) Nominal wage adjustments lag behind price adjustments and remain unsynchronized across different worker groups during the reference time period.

(vi) Price adjustments occur continuously over time, and firms pass on cost increases to prices instantly.

(vii) The relevant distributive variables are the real wage and the real mark-up averaged over the intervals between nominal wage adjustments.

(viii) There is an inverse relationship between the real wage – averaged over the intervals between wage adjustments – and the inflation rate, assuming a fixed interval duration.

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[41] Section 2.2.2 briefly summarizes some works that explore analytical elements that diverge from the standard model developed in this section.

[42] There is a much broader set of inertialist models that follow the theoretical foundations advanced by the references mentioned above. However, in our assessment, these references constitute the analytical foundation upon which the subsequent literature is built.

[43] In this literature, there is an almost consensual view that the standard type of indexation is that in which nominal wages are periodically adjusted to preserve the peak real wage from the previous period. Alternative analytical approaches are explored in Modiano (1985a, 1985b); Modiano and Lopes (1985); Arida (1982).

(ix) There is an inverse relationship between the real wage wage – averaged over the intervals between wage adjustments – and the duration of the interval, assuming a fixed inflation rate.

(x) In an inflationary context, the degree of indexation of a nominal variable reflects the degree of protection of real remuneration (wage or mark-up) against losses caused by inflation.

(xi) As the number of wage adjustments per period increases (i.e., as the frequency of wage adjustments rises), the degree of wage indexation also increases.

(xii) Firms determine *a priori* the equilibrium of the functional income distribution, by setting the real mark-up (and the effective real wage) they aim to achieve.[44]

(xiii) Similarly to structuralist models, the general price index is disaggregated into: (a) a "Fix-Price" sector with prices unresponsive to demand variations (in the literature, this sector is associated with "industrial" or "oligopoly" goods), and determined by application of a desired mark-up over unit direct cost; and (b) a "Flex-Price" sector, commonly associated in the literature to "agricultural" goods, whose prices are influenced by other exogenous variables.

Thus, based on the analytical core described, we present the stylized closed-economy model, following aspects of the formalizations developed by the selected references.[45]

1.2.1. Basic Model

Starting with a basic price algebra, we follow Lopes (1986, pp. 50–63) in presenting a simplified treatment of the components of the accounting truism that describes the elements always present in the general price equation. Since the gross value of a firm's output over a given period must be enough to cover the wage bill plus the cost of intermediate inputs and still generate a gross profit in that period,[46] we can describe the following accounting truism:

$$PQ = WL + P_A A_i + \pi \qquad (1.2.1)$$

Where P is the price of a produced commodity; Q is the quantity of the commodity produced in the production process; W is the average nominal wage; L is the quantity of labor[47]

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[44] There is a critical assumption for this idea to hold: after adjusting nominal wages by the accumulated inflation of the previous period, firms always have the power to immediately raise prices to set the real mark-up they desire.

[45] These works establish the basic descriptions of the key variables in these models: technical coefficients of production; general components of prices; disaggregation of the general price index; evolution of nominal wages; simultaneous determination of prices and wages in an inflationary context; equilibrium inflation rate; and equilibrium in the functional income distribution.

[46] As noted in the introduction, in these models, 'profits' include income categories other than net profit (such as interest, rents, royalties, income associated with monopolies, among others).

[47] The unit of labor used may vary in terms of working time. For example: hours of work, days of work, months of work, etc.

units used by the firm; P_A is the average price of the inputs used by the firm; A_i is the quantity of input used in the production process; π is the firm's gross profit.

It is also possible to express gross profit as a percentage over costs. In that case, gross profit takes the following form:

$$\pi = m(WL + P_A A_i) \qquad (1.2.2)$$

Where m is the real mark-up over direct replacement costs.[48] Substituting (1.2.2) into (1.2.1), we rewrite the gross value of production as follows:

$$PQ = (WL + P_A A_i)(1 + m) \qquad (1.2.3)$$

Dividing both sides of equation (1.2.3) by Q yields the general price equation, which expresses an accounting truism for firms:

$$P = [(\frac{WL}{Q}) + (\frac{P_A A_i}{Q})](1 + m) \qquad (1.2.4)$$

Let "B" denote output per unit of labor (Q/L), and "a" denote output per unit of inputs (Q/A_i). In this way, we rewrite equation (1.2.4) as follows:

$$P = [\frac{W}{B} + \frac{P_A}{a}](1 + m) \qquad (1.2.5)$$

Equation (1.2.5), which results from an accounting truism, provides a generic formal description in which prices necessarily consist of three components: the unit direct cost of wages ($\frac{W}{B}$), the unit direct cost of inputs ($\frac{P_A}{a}$), and the gross profit, that is a function of mark-up ($\frac{W}{B} + \frac{P_A}{a})m$.[49]

If we incorporate the critical assumption from this literature that firms in the "Fix-Price" sector are able to set their prices so as to ensure their desired real mark-up (denoted by m^*) – and, therefore, they pass on any cost increase instantly to their own prices – we can describe the prices in the "Fix-Price" sector by simply introducing m^* into equation (1.2.5), so that:

$$P_{Fix} = [\frac{W}{B} + \frac{P_A}{a}](1 + m^*) \qquad (1.2.6)$$

[48] In other words, m represents a mark-up over the sum of labor costs and input costs, both evaluated at current prices. It is important to emphasize that replacement cost is conceptually different from historical cost, since historical cost requires considering the prices of inputs and labor costs as valued at the time these components were contracted to enter the production process. In a context of persistent inflation, replacement cost is necessarily higher than historical cost, as prices and nominal wages, on average, rise over time.

[49] It is worth noting that, in presenting this accounting truism, the explanation of price components is developed from the perspective of an individual firm. However, because the underlying logic is itself a truism, this literature sometimes applies the same description, derived from the individual case, to the general price level. The shift from particular price cases to the aggregate level is, however, sometimes carried out in an imprecise manner.

Note that even in the "Flex-Price" sector, where firms cannot directly set their own prices, the general components present in equation (1.2.5) remain the same.[50]

Using the basic components of the accounting truism that describes the general price equation, it becomes simple to understand how the inverse relationship between real wage and real mark-up arises in this literature. Without dealing with complications related to the formal representation of the general interdependence among all prices in the economy (and the simultaneous determination of real wage, profit rate, and relative prices), these models rely on simplifications stemming from the very logic of some definitions related to the functional income distribution to justify this distributive antagonism. In the analytical context of closed economies, given the separation of two types of income in the functional distribution – wages (compensation of employees) and profits (gross operating surplus) – it becomes clear that total income necessarily divides into two shares. Consequently, for one part to increase, the other must decrease. Since the real mark-up establishes the share of gross output that remunerates gross profit, this variable determines the fraction of gross profit in total income.[51]

To establish the connections between: (i) on one hand, the wage share in income and the real wage; and (ii) on the other hand, the profit share in income and the real mark-up, the simplest procedure found in this literature is to simplify the general price description by means of an average real mark-up over the wage cost (omitting the input cost). Following, for example, Lopes and Lara-Resende (1979, p. 9), we can represent such a simplification in the price description as follows:

$$P = (1 + m)W(\frac{1}{B}) \tag{1.2.7}$$

Thus, dividing both sides by P, we obtain:

$$1 = (1 + m)\frac{W}{P}(\frac{1}{B}) \tag{1.2.8}$$

Thus:

$$\frac{B}{(1+m)} = \frac{W}{P} \tag{1.2.9}$$

In equation (1.2.9), this simplified representation clearly shows that real wages depend negatively on the real mark-up and positively on the technical coefficient B, which measures output per unit of labor. Note that this representation is not the only simplified way to argue for the existence of distributive antagonism. However, within this strand of inertialist literature, the

[50] As discussed in Section 1.1.1 on structuralist models, the assumption of competition, in the classical sense of the concept, ensures that market prices tend to gravitate around supply prices in the long run, even in the 'Flex-Price' sector.

[51] By logic, the wage share in total income becomes the residual equal to one minus the gross profit share in total income.

inverse relation between real wages and the real mark-up either is assumed by premise[52] or is represented through major analytical simplifications, such as the one described above.

Given the inverse relationship between real wages and the real mark-up, the presentation of the model requires describing the logic underlying the dynamics of nominal wages. The basic assumption about nominal wage dynamics in this literature is that, under inflationary conditions, periodic wage adjustment mechanisms emerge (whether contractual or not) based on indexing nominal wages to the accumulated inflation in the previous period – aiming to compensate for the real wage loss caused by the continuous rise in the general price level. In most inertial inflation models, the standard wage indexation scheme assumes wage adjustments occur at fixed intervals and based on the full (100%) inflation accumulated during the period in which the nominal wage remained constant.[53]

Thus, under these assumptions, the wage policy generates, in each time interval between nominal wage adjustments, a peak real wage at the beginning of the period and a minimum real wage at the end of the period. This happens because nominal wages remain constant within the interval while the general price level continuously increases. The decisive variables for wage dynamics are: b is the real wage; b_{max} is the maximum real wage obtained at the beginning of each period; $\bar{b}$ is the average real wage (calculated as the geometric mean of the real wage within each interval); D is the duration of the time interval in which the nominal wage remains constant; $\hat{P}_i$ is the inflation rate (constant over the interval), calculated as the geometric mean of accumulated inflation; $\hat{P}_{accumulated}$ is the accumulated inflation over the interval; b_{min} (equal to $\frac{b_{max}}{1+\hat{P}_{accumulated}}$) is the minimum real wage in the interval.

To simplify the formalization of the model, following Lopes and Bacha (1983), we add the assumption that the inflation rate remains constant and continuous throughout each period (equal to $\hat{P}_i$). Using these defined variables, it becomes possible to determine the equilibrium of endogenous variables in the model depending on the exogenous variables considered.

Applying logarithmic transformations, if we take b_{max},[54] $\hat{P}_i$ and D as exogenous variables, we determine the average real wage $\bar{b}$ within an interval[55] by:

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[52] Lara-Resende (1979), for example, assumes an inverse relationship between real wage and real mark-up to justify a dynamic of inflation driven by distributive conflict.

[53] Notable examples of models based on such assumptions include: Modigliani and Padoa-Schioppa (1978); Lara Resende (1979); Lopes and Lara Resende (1979); Lopes and Bacha (1983); Arida (1982); Modiano (1983, 1984, 1985a). It is worth noting that, within this literature, Lopes and Bacha (1983) stands out as the seminal work offering the most in-depth analysis of the meanings and implications of nominal wage indexation dynamics.

[54] Established by the wage indexation system at the beginning of each period.

[55] Note that the average real wage over the interval is the geometric mean of the real wage within the interval.

$$\log \bar{b} = \frac{1}{2}\left(\log b_{max} + \log b_{max} - \hat{P}_i . D\right) = \log b_{max} - \frac{1}{2}\hat{P}_i . D \qquad (1.2.10)$$

An immediate conclusion from equation (1.2.10) is that, in this wage indexation system where b_{max} resets at the start of every period, the average real wage ($\bar{b}$) remains constant across successive periods if both the inflation rate and the frequency of nominal wage adjustments stay constant (equivalent to assume that the duration of the intervals remain constant). The equation (1.2.10) determines the average real wage ($\bar{b}$) as an endogenous variable, since the maximum real wage, accumulated inflation, and the duration of intervals between adjustments are assumed exogenous.

Note, from equation (1.2.10), that $\bar{b}$ follows an inverse relationship with $\hat{P}_i . D$ – thus, $\bar{b}$ is inversely to both D and $\hat{P}_i$. The inverse relationship with D arises from the fact that increases in D extend the time over which the real wage is eroded. On the other hand, if D remains fixed, higher values of $\hat{P}_i$ accelerate the real wage decline, causing the minimum real wage (b_{min}) at the end of the period to fall, which lowers $\bar{b}$. Finally, observe that if the product $\hat{P}_i . D$ decreases, this wage indexation system leads to an increase in b̄.

It is possible to illustrate graphically the evolution of the real wage for the entire group of workers whose wage adjustments occur on the same date, following the described wage indexation system. Supposing that labor productivity remains constant during the considered period:

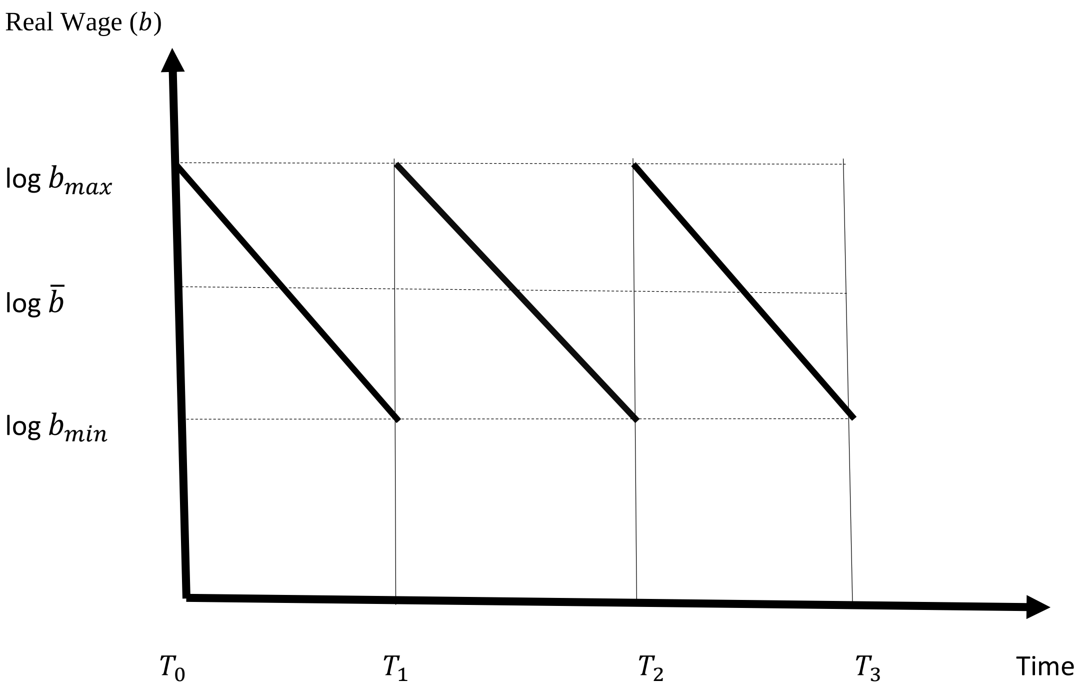

Figure 1. Trajectory of real wages for workers who adjust salaries on the same dates under the assumed indexation system. Own elaboration.

As can be observed, the graph shows a logarithmic transformation of the average real wage trajectory for workers who adjust their wages on the same date.[56] In the Figure 1, changes in the slope of log b correspond to changes in the inflation rate: the higher the inflation rate, the more steeply negative the curve; the lower the inflation rate, the less steeply negative the curve.[57]

With this graphical representation, it becomes straightforward to illustrate the inverse relationships between: (i) real wage and inflation rate; and (ii) real wage and the length of intervals between wage adjustments:

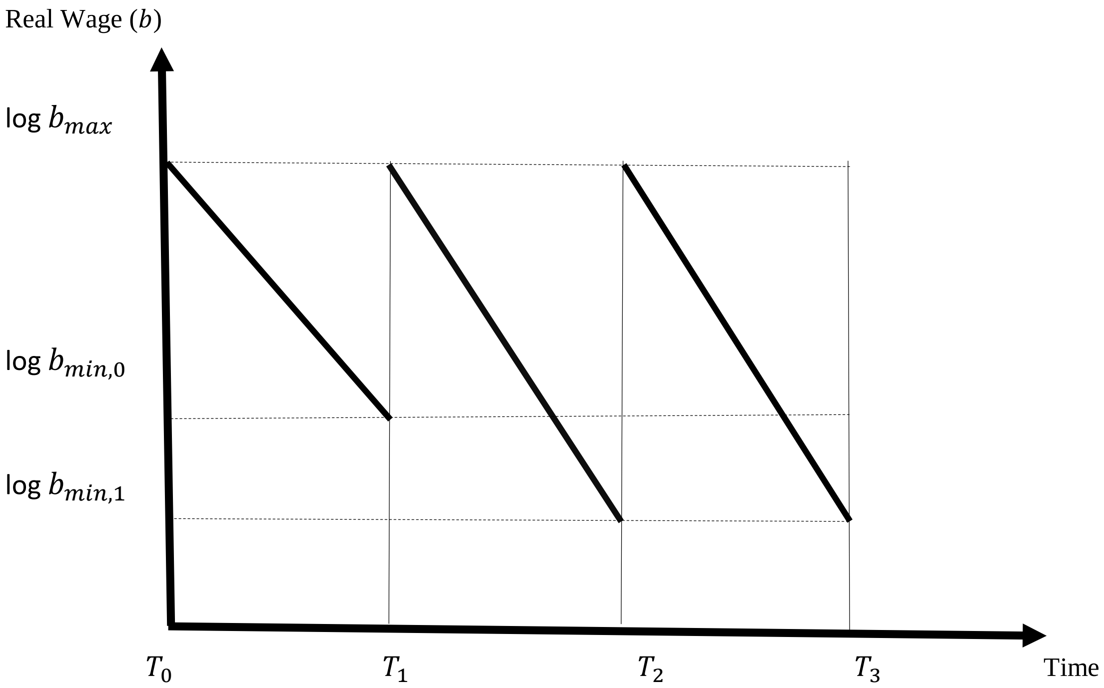

Figure 2. Trajectory of the real wage for workers who adjust their wages on the same dates in the case of rising inflation. Own elaboration.

In the graph above, $b_{min,0}$ represents the minimum real wage in the interval between T_0 and T_1, $b_{min,1}$ is the minimum real wage in the interval between T_1 and T_3, b_{max} is the maximum real wage restored at the beginning of each period. Thus, the graph depicts a situation where inflation rises and reaches a new constant level from period T_1 onward, while the time intervals between nominal wage adjustments remain constant. In this setting, accelerating inflation corresponds to an increased slope of the real wage curve $\log b$, implying a decrease in the

[56] The real wage path shown in this graph corresponds to what Dornbusch (1986, pp. 7–10) called the "Simonsen-Pazos Mechanism," based on the analyses of Simonsen (1983) and Pazos (1972), which describe the same behavior of this variable in an inflationary context with indexation.
[57] In a hypothetical deflationary scenario, the slope of the $\log b$ curve would be positive, and the real wage would rise between adjustment intervals.

minimum real wage (and consequently in the average real wage) in the intervals from T_1 onward.

Graphically, we can also illustrate the inverse relationship between the real wage (averaged over the successive intervals) and the duration of the adjustment intervals as follows:

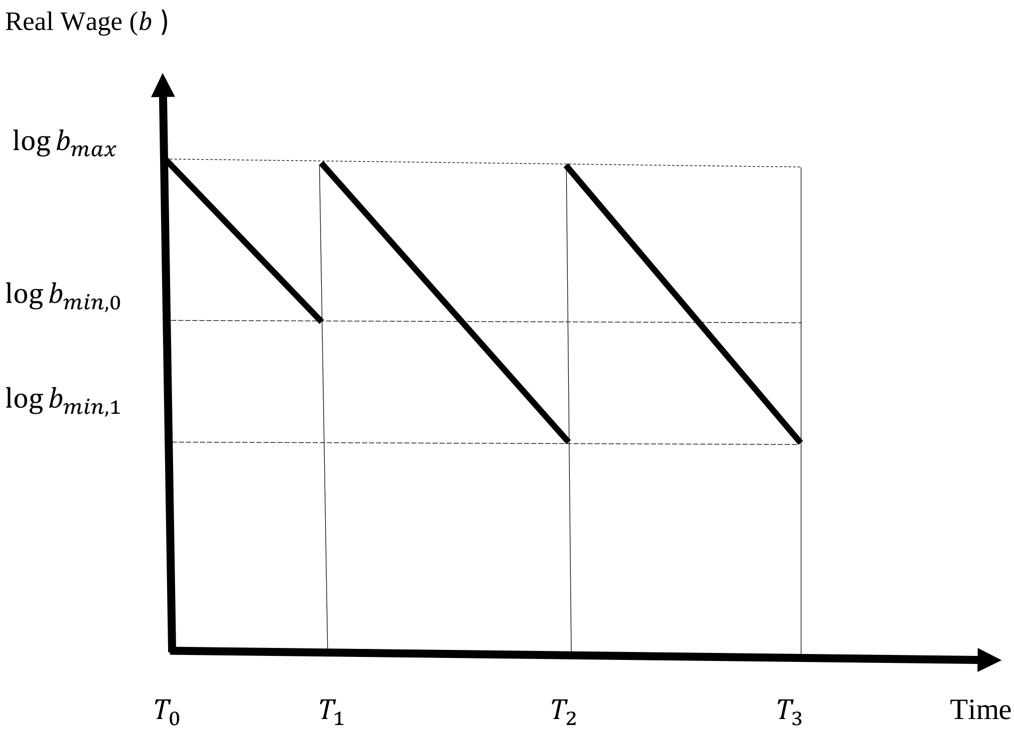

Figure 3. Real Wage Trajectory for workers who adjust their wages on the same dates in the case where the duration of intervals between adjustments increases. Own elaboration.

In the graph above, the inflation rate remains constant in all intervals, but the duration of the intervals increases starting from T_1. As a result, the minimum real wage and the average real wage become lower from T_1 onward.

Note that equation (1.2.10) and figures (1), (2), and (3) represent the trajectories of the discussed variables for groups of workers who adjust their wages on the same dates. However, an important assumption, consensually accepted in this strand of inertial inflation models, is that wage adjustments are unsynchronized among different groups of workers, distributed across possible adjustment dates within each considered period. To formalize average nominal wage adjustments across periods in the general case of unsynchronized adjustments – where different worker groups are uniformly distributed across possible wage adjustment dates within each reference period – and following Lopes and Bacha (1983), we maintain the assumption that the time intervals between nominal wage adjustments are identical for all groups. This assumption complements the previously introduced condition of linear inflation within each reference period. Under these conditions, due to the uniform distribution of wage adjustments and the constant inflation rate, the average real wage across all workers becomes equal to the average real wage analyzed thus far.[58]

Thus, based on this set of assumptions (and given that, by definition, $b = \frac{W}{P}$), Lopes and Bacha (1983) conclude, through algebraic manipulation of equation (1.2.10), that the variation in average nominal wages under this indexation scheme gives rise to a dynamic in which nominal wage adjustments are partially indexed to current-period inflation and partially indexed to inflation in the previous period, such that:

$$\widehat{W} = h\hat{P}_t + (1-h)\hat{P}_{t-1} \qquad (1.2.11)$$

$$h = 1 - \frac{1}{2n}$$

Where n is the frequency of adjustments within a given reference time period.

From equation (1.2.11), as can be observed, the higher the frequency of nominal wage adjustments within a given period, the higher the degree of indexation to current inflation; conversely, the lower the frequency, the lower the degree of indexation.

It is important to highlight that the model assigns a key meaning to what we call the "degree of indexation": the degree of indexation of a nominal variable in an inflationary context becomes equivalent to the degree of protection against losses of real remuneration caused by rising prices. Given the logic of nominal wage dynamics in the model, it is possible to note that as the number of wage adjustments per period increases and the parameter "h" approaches unity, the system converges to perfect indexation. In the limit, in a hypothetical case where $h = 1$, the real wage would be fully protected from inflation.

However, note that there is a practical problem related to the notion of perfect indexation. Increasing the degree of indexation to current inflation implies progressively shortening the intervals during which the nominal wage remains constant (increasing the frequency of adjustments). Perfect indexation corresponds to a situation where these intervals disappear, so nominal wages adjust instantaneously in response to any price increase. This hypothesis is unrealistic to represent the dynamics of nominal wage adjustments in inflationary contexts.[59] Therefore, any nominal wage indexation scheme cannot perfectly protect against real wage

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[58] Note that this conclusion is only valid if the inflation rate remains constant: "As any aggregation rule this is an approximation, which is exactly true only under special conditions: in our case only under a constant rate of inflation" (Lopes; Bacha, 1983, p. 3).

[59] Exceptions will be explored in Chapter 3, where we address hyperinflation dynamics. A key feature of hyperinflations is the indexation of nominal wages to the nominal exchange rate, which depreciates following an accelerationist path, as discussed by Franco (1986, 1987); Lopes (1989); Merkin (1986), and others.

losses, because the very existence of a time lag in the wage adjustment response to rising general price levels inherently causes unprotected losses.

It is worth emphasizing that this same logic about the relationship between indexation of nominal variables and protection against inflation that applies to wages also applies to all other nominal remuneration variables (interest, rents, mark-up, etc.). Thus, assuming that all other real remunerations (except wages) do not suffer inflation-induced losses is equal to assuming that those variables are perfectly indexed.

Regarding this last point, a critical assumption in the inertial inflation theory models is precisely the notion that prices are set as a fixed real mark-up over replacement costs – which means the nominal mark-up is assumed to be perfectly indexed to current inflation, so costs pass-through to prices are considered instantaneous.[60] From this critical assumption follows the conclusion that, in the description of the inflationary process by inertialist models, inflation does not cause losses in the real mark-up, unlike what happens with the real wage. It is worth noting that, in a related way, as a consequence of the inverse relationship between real wage and real mark-up, the assumptions of imperfect indexation of nominal wages and perfect indexation of the mark-up lead inertial inflation models to a very peculiar analytical conclusion: the notion that firms are able to determine the equilibrium of the functional income distribution *a priori* by setting the real mark-up (and the effective real wage) they desire.[61]

To understand this specific mode of determining the equilibrium of the functional income distribution in an inflationary context, it is useful to revisit figures (1), (2), and (3), which illustrate the trajectory of the average real wage within each interval between nominal wage adjustments as described by equation (1.2.10). These models state that the average real wage is set at the level at which the real mark-up targeted by firms becomes effective. Thus, regardless of the theoretical interpretation given to the difference between the maximum real wage (b_{max}) and the average real wage ($\bar{b}$),[62] these models assume that the variable $\bar{b}$ is exogenously determined by the firms' mark-up target.

To represent the unilateral determination of the functional income distribution through the mark-up that firms desire and impose, we must treat $\bar{b}$ as an exogenous variable and $\hat{P}$ as an endogenous variable. By maintaining the assumptions of the described wage indexation system, the inflation rate becomes the endogenous variable whose equilibrium is determined at

[60] Pereira and Nakano (1987, p. 40) interpret the immediate pass-through of cost increases to prices as a form of "informal indexation".
[61] As explicitly stated, for example, in Arida (1982), Lara-Resende (1979), and Lopes (1986).
[62] Whether through conflicting claims over distribution or pure "inertia," as discussed by Ros (1989) and Serrano (1986).

the exact level necessary to realize the $\bar{b}$ desired by the firms. Building on analytical aspects advanced in Arida (1982), Fraga (1985), and Lara-Resende (1979), we can return to equation (1.2.10) to endogenously determine the accumulated inflation rate within each interval. Using the variables already defined, we can describe the general price index as:

$$P(t) = P(0).e^{\hat{P}_i t} \qquad (1.2.12)$$

$$0 \leq t \leq D$$

In this case, the log of the real wage (b) at any moment within the interval is given by:

$$\log b = b_{max} - \hat{P}_i t \qquad (1.2.13)$$

Since firms manage to achieve their desired average real wage over the intervals ($\bar{b}$) by raising prices, by assumption, we can rewrite equation (1.2.10) and treat $\bar{b}$ as exogenous ($\bar{b}^*$), so that

$$\log \bar{b}^* = \frac{1}{2}(\log b_{max} + \log b_{max} - \hat{p}_i D) = \log b_{max} - \frac{1}{2}\hat{P}_i D \qquad (1.2.14)$$

Firms set $\hat{P}_i$ according to the rate needed to achieve $\bar{b}^*$. By algebraically manipulating (1.2.14), we obtain:

$$b_{max} - \bar{b}^* = \frac{1}{2}\hat{p}_i D \qquad (1.2.15)$$

It is crucial to highlight from equations (1.2.14) and (1.2.15) that the only endogenous variable determined by the model is the constant inflation rate within the period $\hat{P}_i$. Note, therefore, that the model treats as exogenous data the difference between b_{max} and $\bar{b}^*$, as well as the duration of the interval between wage adjustments (D). Since $\bar{b}^*$ is exogenously given, it is not possible to assume an effective real wage different from the firms' target by shortening the periodicity of nominal wage adjustments. Increasing the frequency of wage adjustments only accelerates inflation, fully reversing the impact on the real wage. From this perspective, it is logical to affirm that shortening the periodicity of nominal wage adjustments represents inflationary shocks without distributive repercussions, as asserted by Lara Resende and Lopes (1979). In the context of the previously presented figures, shortening periodicities only steepens the slope of the real wage curve.

Considering the logic of endogenous determination of the inflation rate described above, for given exogenous values of b_{max}, $\bar{b}^*$, and frequencies of nominal wage adjustments, it is necessary to highlight a fundamental element of inertial inflation models: the described dynamics generate equilibrium inflation levels, which only change with the introduction of shocks that impact the model's exogenous variables (and these shocks imply a dynamic transition trajectory to other equilibrium inflation levels). Regarding the possibilities of generating changes in the exogenous variables, an important analytical element in inertial inflation models – similarly to the structuralist models already discussed – is the disaggregation of the general price index into distinct sectors (the "Fix-Price" sector, determined as a desired markup over unit direct cost; and the "Flex-Price" sector, whose price determination process is influenced by other exogenous variables).

As in the structuralist theory section, disaggregating the general price index in inertial models plays a fundamental role in explaining inflation dynamics because it allows the formal representation of shocks, making it possible to understand processes that generate changes in equilibrium inflation levels. In simplified terms, the disaggregation of the general price index into two groups is represented in closed economy models as follows. The "Fix-Price" sector follows the pricing-setting process as described in equation (1.2.6), which reflects the exact general accounting truism that describes prices, but specified in a way that incorporates the real mark-up desired and achieved by firms (m^*):

$$P_{Fix} = [\frac{W}{B} + \frac{P_A}{a}](1 + m^*) \qquad (1.2.6)$$

Considering that the technical coefficient "a" remains constant over the period under consideration, inflation in the "Fix-Price" sector is represented by equation (6) rewritten in terms of rates of change:

$$\hat{P}_{Fix} = \lambda_L(\widehat{W} - \hat{B}) + (1 - \lambda_L)\widehat{P_A} + \delta(\widehat{1 + m^*}) \qquad (1.2.16)$$

Where λ_L and $(1 - \lambda_L)$ are, respectively, the shares of the wage bill and of input costs in the unit direct cost, and δ is the portion of inflation in $\hat{P}_{Fix}$ generated by the increase in the desired real mark-up.

By contrast, "Flex-Price" sector prices are assumed to be exogenous, as in Modiano (1983, p. 5).[63] It is worth noting, however, that these prices are part of workers' consumption baskets and are also used as inputs in the production processes of the "Fix-Price" sector, so that increases in P_{Flex} lead to increases in both P_{Fix} and $\widehat{W}$.

The disaggregated general price index, in turn, is represented by:

$$P = p_{Fix}^{\sigma_1} p_{Flex}^{\sigma_2} \qquad (1.2.17)$$

$$\sigma_1 + \sigma_2 = 1$$

[63] Another way to specify P_{Flex} is to consider that they are determined by an interaction between supply and demand. Some inertialist models formalize this as a function of aggregate demand and output gap, as obtained in Modiano (1984a, p. 6). However, this specification of agricultural price determinants has theoretical problems, and the empirical results in Modiano (1984a) confirm its inadequacy.

Where σ_1 and σ_2 represent the shares of the total value of the basket of goods that make up the general price index corresponding, respectively, to "Fix-Price" and "Flex-Price". Equation (1.2.17), expressed in terms of rate of change, becomes:

$$\hat{P} = \sigma_1 \hat{P}_{Fix} + \sigma_2 \hat{P}_{Flex} \tag{1.2.18}$$

$$\sigma_1 + \sigma_2 = 1$$

Finally, in light of the disaggregation, we can discuss how the model reaches an equilibrium in which both the inflation rate and the average real wage stabilize at a given level. The first step to understanding why inflation converges to equilibrium levels, from this perspective, is to recognize that prices and nominal wages in the model are determined simultaneously. In this sense, nominal wage adjustments are determined as a function of prices, and price adjustments are likewise determined as a function of wages. Equilibrium is obtained when the growth rates of nominal wages and the general price index become equal in successive periods, such that $\hat{P} = \widehat{W} = \hat{P}_{-1} = \widehat{W}_{-1}$. As previously discussed, assuming as given the maximum real wage at the beginning of each period, the average real wage in each period, and the duration of each period, the model determines the inflation rate by the requirement to make the desired average real wage become the effective real wage within each interval, while the nominal wage adjustments merely offset the accumulated inflation in accordance with the indexing system previously described. Thus, in the absence of shocks that change relative prices, the gap between the maximum and the average real wage remains constant, and inflation stabilizes.

However, when there are exogenous shocks, a group of prices rises more than past inflation, which simultaneously affects both firms' production costs and workers' effective real wages. In this context, in addition to the initial price increase caused by exogenous factors, the assumption that prices are set as a real mark-up over replacement cost implies that firms immediately pass on these cost increases to their own prices until the real mark-up is restored, thereby reducing even more the average real wage over the interval in which the nominal wage remains fixed (which is taken as given).

Since price adjustments and wage adjustments across worker groups are not synchronized, an exogenous shock to "Flex-Prices" triggers a transition process between the pre-shock equilibrium levels of inflation and real wages and the new post-shock equilibrium levels. During this transition, inflation accelerates and the real wage falls. It is worth noting, however, that once the real mark-up desired by firms is reestablished – and, consequently, the new average real wage associated with the post-shock relative price configuration is achieved

– inflation stabilizes at a new (higher) level, which will only change again if further exogenous shocks occur.

1.2.2. Analytical Alternatives in Inertial Inflation Models

This section briefly summarizes some of the analytical alternatives explored in the literature concerning aspects of the model under discussion. Among the core elements that required the most analytical effort, the assumptions related to the wage indexation system stand out. Some works proposed new specifications for the assumptions on the dynamics of nominal wage adjustments, most notably: Modiano (1985a, 1985c); Lopes (1984a); Arida (1982).

As discussed in the previous section, the standard formulation of the wage indexation system in this literature is the one described by equation (1.2.10) and Figures 1, 2, and 3. This formulation assumes: (i) wage adjustments occur at fixed and exogenously determined intervals; (ii) each wage adjustment fully restores the maximum real wage of the previous period by means of a complete pass-through of the accumulated inflation. As an alternative, Arida (1982), Lopes (1984a), and Modiano (1985c) model wage adjustment dynamics in an indexation system where the adjustment frequency becomes an endogenous variable, while the minimum real wage in each period remains an exogenous one. This type of wage adjustment policy in an inflationary context corresponds to what became known as the "escala móvel", which sets an automatic nominal wage adjustment whenever accumulated inflation reaches a specific threshold, institutionally defined as an exogenous variable. As a result of endogenizing the adjustment frequency, every time inflation accelerates, the interval between adjustments shortens automatically; in turn, shorter intervals accelerate inflation, which further reduces the adjustment interval, and so on. These studies investigate the possibility of an explosive inflationary dynamic in which the wage indexation system itself fuels inflation acceleration.

Focusing on another aspect of the wage indexation system, Modiano (1985a) examines the inflationary consequences of a system with more frequent wage adjustments but with less than 100% compensation for accumulated inflation.

Another key element of the model that inspired alternative formulations involves the idea that inflationary processes generate a predetermined distributive outcome based on the power of firms to set their desired real mark-up. In this regard, Modiano (1983, 1984) briefly explore the possibility that mark-up indexation to inflation is not perfect – through the hypothesis of "flexible mark-ups." Under this assumption, although the author does not fully develop the theoretical implications, shorter wage adjustment intervals (i.e., more frequent wage adjustments) may increase the average real wage and reduce the real mark-up.

1.2.3. Contributions and Problems of Inertial Inflation Theory Models

a. Analytical Contributions

Among the analytical contributions of the inertial inflation theory models, the most prominent is the deeper formalization of nominal wage indexation schemes. The specification of nominal wage dynamics allows a more precise understanding of the relationships between adjustment frequencies, indexation, and the degree of protection for real wages. Building on this improved understanding, the simultaneous determination of prices and nominal wages also clarifies the relationship between inflation and functional income distribution. A proper understanding of this relationship is possible because of a broader description of the price-setting process, starting from an accounting truism that specifies some of the basic components of prices and the functional income distribution.

Another important analytical contribution of these models is the specification of the convergence process toward an equilibrium inflation rate and real wage. This convergence process allows clear identification of the factors that raise or reduce the inflation rate. In inertialist models, the description of nominal remunerations adjustments (wages and prices) as functions of the same (lagged) nominal remunerations gives precision and predictive capacity to assess the impacts of shocks which directly affect functional income distribution on nominal variables, given the indexation systems in place.

Finally, the detailed formalization of the elements that determine prices in the "Fix-Price" sector and the dynamics of nominal wages, combined with the disaggregation of the general price index, made it possible to estimate the impacts of shocks from exogenous variables on the inflation level. This analytical depth also supports a clearer connection between theoretical elements and implications for economic policymaking.

b. Analytical Problems

Despite the relevant contributions developed by inertial inflation theory, some analytical elements of the model rely on assumptions that fail to adequately represent the inflationary process. Among these elements, the first that stands out is the assumption of full indexation of nominal mark-ups (i.e., complete and immediate pass-through of cost increases to prices). In practice, there is a lag between rising costs and price adjustments. A more accurate specification of the price-setting process in the “Fix-Price” sector would be to consider that firms apply a nominal mark-up over historical costs, rather than a real mark-up on replacement costs. Sylos-Labini (1979, 1982) provide important empirical studies arguing for partial cost pass-through to prices. In inflationary contexts, the dynamics of nominal mark-up adjustments, with lags, should reflect imperfect indexation.

Closely related to this first point, inertialist models typically omit any explicit analytical separation between nominal and real mark-ups. This is a second major problem in this literature. Part of the explanation for the *a priori* determination of distributive outcomes in inflationary contexts comes from ignoring the possibility that prices are set using nominal mark-ups on historical costs, with no perfect indexation of nominal mark-ups. When one assumes that the desired (and achieved) real mark-up is fixed, perfect indexation of this variable becomes a direct logical outcome of that omission. The distributive results of such assumptions are clear: exogenous shocks that accelerate inflation by altering relative prices only reduce real wages, while the real mark-up remains fully protected from cost-driven losses.

Finally, it is worth noting that the disaggregation of the general price index in these models is extremely simplified – sometimes intentionally[64] – just as in structuralist theory.

1.2.4. Conflicting Claims over Distribution, Adjustment Frequencies, and the Inertialist Model

To conclude this section, it is necessary to assess how inertial inflation theory relates to the view of inflation as an expression of both conflicting claims over distribution and to the frequencies of nominal prices and wages adjustments.

First, note that these models exhibit an ambiguous relationship with two possible interpretations of the inflationary process: (i) as resulting from conflicting claims over distribution, or (ii) as an expression of “pure inertia”.[65] Based on the model presented in Section 1.2.1, the central point that gives rise to these differing interpretations is the theoretical

[64] The extreme simplification in stylized models serves the analytical purpose of highlighting core mechanisms without the complications introduced by detailed formalizations of how exogenous variables affect the inflation level. However, dividing prices into broad 'agricultural' and 'industrial' categories overlooks other important price groups, such as fuels, minerals, energy, and government-administered prices. Braga and Summa (2016), Haluska (2016), Rozenwurcel (1985), and Haluska, Summa, and Lara (2023) offer advances toward more comprehensive disaggregation formalizations.
[65] As discussed by Ros (1989), Serrano (1986), and Bacha (1986).

explanation for the persistent gap between b_{max} and $\bar{b}^*$ in each period between nominal wage adjustments.

In the interpretation of inflation through the perspective of conflicting claims over distribution:[66] workers set b_{max} as their real wage target each period, while firms set $\bar{b}^*$ as their real wage target. The impossibility of achieving both targets simultaneously would justify autonomous and persistent increases in prices and wages, because "workers do not have the power to impose price controls on firms, and firms do not have the power to impose partial wage indexation on workers" (Arida, 1982, p. 313).[67] The gap between maximum and average real wages is thus an exact representation of the incompatibility between the real wage targets of workers and firms. From this viewpoint, the convergence of the inflationary process to an equilibrium level where $\hat{P} = \widehat{W} = \hat{P}_{-1} = \widehat{W}_{-1}$ does not imply a solution of the conflict – it is simply a consequence of existing indexation schemes.

In this perspective, conflicting claims over distribution trigger autonomous increases in nominal wages and prices, so frequencies of adjustments do not causally explain inflation. However, the frequencies do become relevant variables in determining the inflation rate equilibrium. This is because, for given terms of the distributive incompatibility, the shorter the intervals during which nominal wages remain constant, the higher will be the inflation rate required to establish the real wages desired by firms – and the higher will the number of nominal wage increases in each reference period.[68]

An alternative interpretation considers inflation as purely inertial.[69] In this case, it is assumed that workers gradually adapt their real wage targets in an inflationary context. Over time, they aim to match the average real wage in each period. However, wage adjustments to restore the peak of the real wage distribution result from rational behavior. Adjusting for less than 100% of past inflation would cause individual losses in real remuneration.[70] Thus, the difference between b_{max} and $\bar{b}^*$ stems from a protective mechanism rooted in rational action. In practice, workers seek to secure $\bar{b}^*$. Thus:

> Inertialists do not deny that the inflationary process may have originated in conflicting claims over distribution. Their argument is that inflation resolves this conflict, and

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[66] Exemples include: Arida (1982); Lara-Resende (1979); Lance Taylor (1979, 1983); Ros (1984); Modiano (1984, 1985a, 1985b, 1987).
[67] Own translation.
[68] They act as an amplifier of the equilibrium inflation level, given the terms of the distributive incompatibility.
[69] Among the works that advance this interpretation (or assume it implicitly), notable examples include: Lopes (1984b), Arida and Lara Resende (1984).
[70] As pointed out by Ros (1989): "In such a state of steady inflation, the target real wage is the real wage received on average over the indexation period. The fact that at every wage settlement workers claim a 100% adjustment to obtain the previous peak real wage does not reflect an aspiration gap. It reflects, rather, rational behavior in a situation where the system has been caught in a non zero sum, non-coordinated game." (ROS, 1989, p. 9).

> that is why it becomes inertial – remaining stable at a given level until disturbed by a supply or demand shock. (Bacha, 1986, p. 3).[71]

It is important to emphasize that many models treat frequencies of adjustments as purely institutional variables. In this case, institutionalizing these frequencies and managing them through economic policy would represent an exogenous political stabilizing element in the model. Such control would prevent an escalating conflict from triggering ever shorter adjustment intervals (i.e., increased frequencies), thereby avoiding the endogenous emergence of an explosive inflationary dynamic.[72]

These models, however, do not establish a connection between conflicting claims over distribution and adjustment frequencies based on the notion of bargaining power. The assumption of perfect mark-up indexation – and thus a predetermined functional income distribution – means that changes in adjustment frequencies are not connected to workers' real wage gains. In such cases, increased frequency merely reflects workers' attempts to shield themselves from inflation-induced losses in real wages, albeit unsuccessfully.

Finally, it is important to note that, in this literature, exogenous shocks that alter relative prices affect the equilibrium inflation rate, potentially raising or lowering it with a lag. However, the model presented does not treat inflation as exclusively driven by such exogenous shocks.

1.3.A. CONFLICTING CLAIMS INFLATION THEORY

What has come to be known as 'conflicting claims' models refers to the group of inflation models dominant in Post-Keynesian literature,[73] which follow the approach initiated by Rowthorn (1977), in its most simplified formal version developed by Dutt (1987).[74] The shared theoretical starting point across this group is the premise that the functional income distribution is determined by the general pricing process of produced goods, which involves applying a mark-up over unit direct costs, as argued by Blecker (2011, p. 215).[75] In this section, we

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[71] Own translation.

[72] This possibility of explosive inflation dynamics is more likely in cases where exogenous shocks alter relative prices ($\uparrow \frac{P_{Flex}}{P_{Fix}}$), since shorter adjustment intervals tend to be associated with prior inflation acceleration.

[73] By post-Keynesian, we use the broad definition provided by Lavoie (2022), which encompasses several distinct strands, including Fundamentalists, Kaleckians, Kaldorians, Sraffians, and Institutionalists.

[74] As in Blecker and Setterfield (2019), Lavoie (2022), Bastian and Setterfield (2020), and the recent post-Keynesian literature.

[75] In turn, the approach to general price determination through the application of a mark-up over unit direct costs – and the relationship between prices and income distribution – draws primarily on the analyses developed by Kalecki (1954), Weintraub (1958), and Okun (1981), as noted in Lavoie (2022, p. 172). The various approaches that propose variations within this same theoretical framework are presented in Lavoie (2022, pp. 164–172).

critically assess the analytical roles of conflicting claims over distribution, the frequency of wage and price adjustments, and exogenous shocks to relative prices in this framework.

As with the other theories discussed thus far, the broad literature on conflicting claims models reveals a shared analytical core. The main references for the theoretical perspective discussed here include: Rowthorn (1977, 2024); Dutt (1987); Lavoie (2022); Blecker and Setterfield (2019); Hein (2023); Bastian and Setterfield (2015, 2020); Bastian, Charles, Marie (2024); Blecker (2011); Campaña (2024).

The analytical core of these models, in a closed economy, integrates the following ideas:

(i) There is a general pricing process based on applying a real mark-up over unit direct costs.

(ii) Reduction of unit direct costs to wage costs (only in closed economy context).

(iii) Representation of the inverse relationship between real wages and the real mark-up through the price equation.

(iv) Definition of a workers' target real wage.

(v) Definition of a firms' target real mark-up (which translates into a target real wage, given the inverse relationship between these variables).

(vi) Description of equations for nominal wage and price adjustments as functions of: (a) conflicting claims over distribution, expressed by the differences between actual real wages and each class's target real wage; (b) each class's bargaining power to realize the real income increase consistent with its target.

(vii) Inflation converges to an equilibrium determined by: (a) the magnitude of the parameters capturing each class's bargaining power; (b) the magnitude of distributive incompatibility (defined as the differences between actual real wages and each class's target real wage).

(viii) Real wages converge to an equilibrium level determined by: (a) the relative bargaining power of the classes; (b) the magnitude of distributive incompatibility.

Based on the analytical core described above, we present the stylized model of conflicting claims' approach, following the theoretical aspects advanced by the cited references.

1.3.A.1. Basic Model

We begin with the simplified version of the price-setting process in these models, as applied to the context of a closed economy, in which the price is defined as a mark-up over the unit direct cost (assumed to consist solely of the wage bill). In this approach, the description of prices consists of:

$$P = (1 + m).(\frac{W}{B}) \quad (1.3.A.1)$$

As a direct consequence of this specified representation of the price-setting process in closed economies, it becomes evident that inflation can only be explained by increases in the components of prices – in this case, the mark-up, the nominal wage, and the technical coefficient of output per unit of labor (Q/L). By rewriting equation (1.3.1) in terms of growth rates, we obtain the possible determinants of inflation in these models under closed economy conditions:

$$\hat{P} = (\widehat{1 + m}) + \widehat{W} - \hat{B} \quad (1.3.A.2)$$

By definition, equation (1.3.2) makes it clear that inflation may result from: (i) increases in the real mark-up set by firms ("profit-inflation"); and (ii) increases in nominal wages that exceed the growth rate of the technical coefficient of output per unit of labor ("wage-inflation").

According to equation (1.3.1), it is straightforward to demonstrate the inverse relationship between the real wage and the mark-up. By algebraically manipulating the price equation, we obtain:

$$1 = (1 + m)(\frac{W}{P})(\frac{1}{B}) \quad (1.3.A.3)$$

Therefore, the inverse relationship between the real wage and the mark-up can be expressed as:

$$\frac{W}{P} = (\frac{B}{1+m}) \quad (1.3.A.4)$$

Assuming that the technical coefficient B remains constant, it follows directly that the real mark-up and the real wage are inversely related. That is, the higher the real mark-up, the lower the real wage – and vice versa. Given the distributive antagonism between real wage and the mark-up, it is logical to analyze the dynamic of rising nominal wages and prices as driven by workers' attempts to increase real wage and by firms' attempts to raise the real mark-up (by reducing the effective real wage). This is precisely the foundation of the conflicting claims equations, which describe nominal wage and price adjustments as attempts by both classes of agents to raise their own real remuneration while simultaneously reacting to the opposing class's efforts to do the same.

Let: b is the effective real wage; b^w is the workers' target real wage; β^W is the parameter capturing workers' bargaining power; b^k is the firms' target real wage; β^K is the parameter capturing firms' bargaining power. Based on these defined variables, the conflicting claims equations describe wage and price adjustments as:

$$\hat{P} = \beta^k(b - b^k) \quad (1.3.A.5)$$

$$\widehat{W} = \beta^w(b^w - b) \quad (1.3.A.6)$$

It is important to highlight from equations (1.3.5) and (1.3.6) that the existence of conflicting claims over distribution refers to a situation in which $b^k < b < b^w$ is assumed. In this case, when there is distributive incompatibility – defined as a positive $(b^w - b^k)$ for any given level of b – there emerges a persistent dynamic of wage and price adjustments as described by equations (1.3.5) and (1.3.6). If the parameters β^k and β^w assume finite values, the inflationary process converges to an equilibrium in both the inflation rate and the real wage, where $\hat{P}_t = \hat{P}_{t-1} = \widehat{W}_t = \widehat{W}_{t-1}$.[76] The model determines the equilibrium levels of inflation and real wages, respectively, as:

$$\hat{P}^{equilibrium} = \frac{\beta^w\beta^k + (b^w - b^k)}{\beta^w + \beta^k} \quad (1.3.A.7)$$

$$b^{equilibrium} = \frac{\beta^w b^w + \beta^k b^k}{\beta^w + \beta^k} \quad (1.3.A.8)$$

According to equations (1.3.7) and (1.3.8), the equilibrium inflation rate is a positive function of the absolute values of the parameters that capture the bargaining power of both classes (β^W and β^K) and of the magnitude of conflicting claims over distribution $(b^w - b^k)$. On the other hand, the equilibrium real wage depends on the relative bargaining power between the two classes (i.e., which class holds greater bargaining power, which can be expressed as $\frac{\beta^K}{\beta^W}$ or $\frac{\beta^W}{\beta^K}$) and on the magnitude of conflicting claims over distribution $(b^w - b^k)$. The class with higher bargaining power has more capacity to bring b closer to its own target. Graphically, the inflationary process described by equations (1.3.5) to (1.3.8) can be represented as follows:

[76] Note that, since the real wage is equal to $\frac{W}{P}$, the equality between $\widehat{W}$ and $\hat{P}$ ensures the stability of real wage.

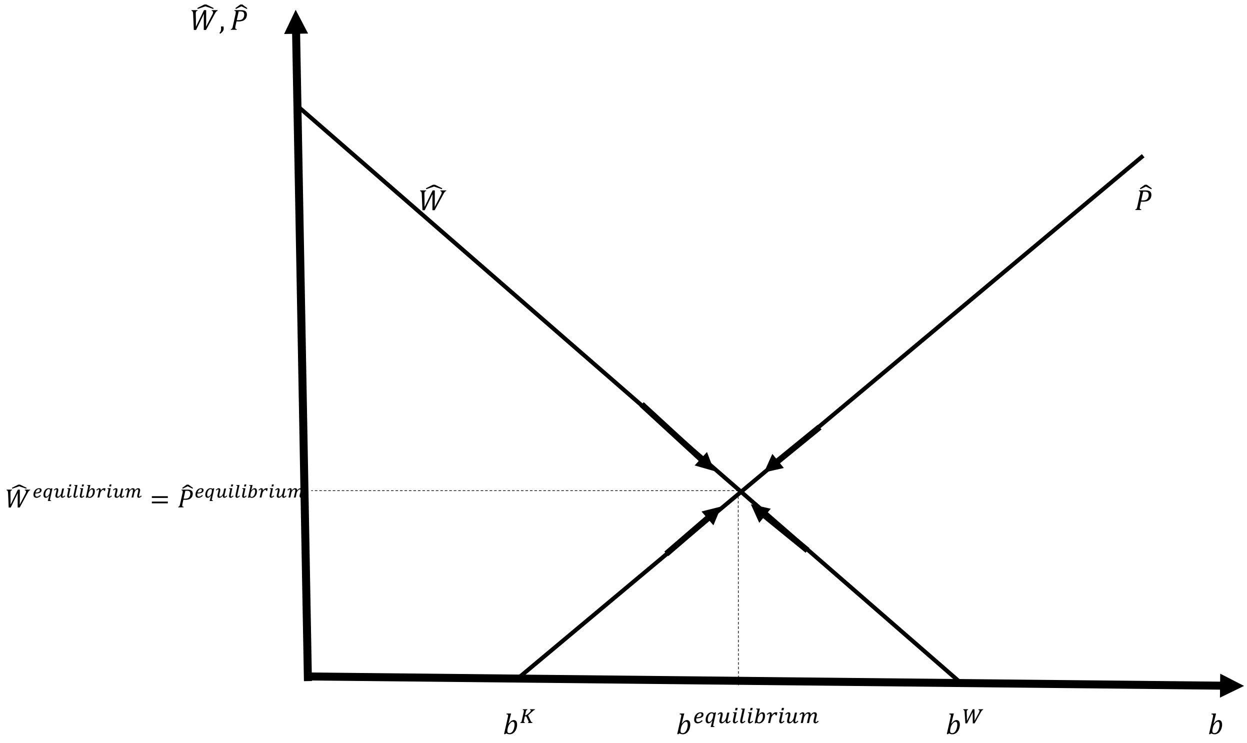

Figure 4. Equilibrium of the inflation rate and real wage in conflicting claims models when β^W and β^K assume finite values. Own elaboration.

Figure 4 represents the conflicting claims equations as a positively sloped price reaction function and a negatively sloped nominal wage reaction function. The slopes of these reaction functions are determined by the bargaining power parameters: the higher β^K is, the steeper the $\widehat{P}$ curve; the higher β^W is, the steeper the $\widehat{W}$ curve. In hypothetical cases where the bargaining power parameters are infinite, the $\widehat{P}$ and $\widehat{W}$ curves become vertical.

Based on the equilibrium values of the inflation rate and the real wage described in equations (1.3.7) and (1.3.8), we can analyze three extreme cases of distributive outcomes. First, there is the situation in which b equals b^k. For this to occur, β^k must be infinite and β^w finite. Conversely, in the opposite case where b equals b^W, β^W must be infinite and β^K finite. In the hypothetical case in which both classes have infinite bargaining power, the dynamics of wage and price adjustments do not converge to equilibrium. Instead, an accelerationist dynamic of price and wage increases emerges, with no intrinsic limits to their growth.

Graphically, we can represent the hypothetical situation in which firms hold infinite bargaining power and workers have finite bargaining power as follows:

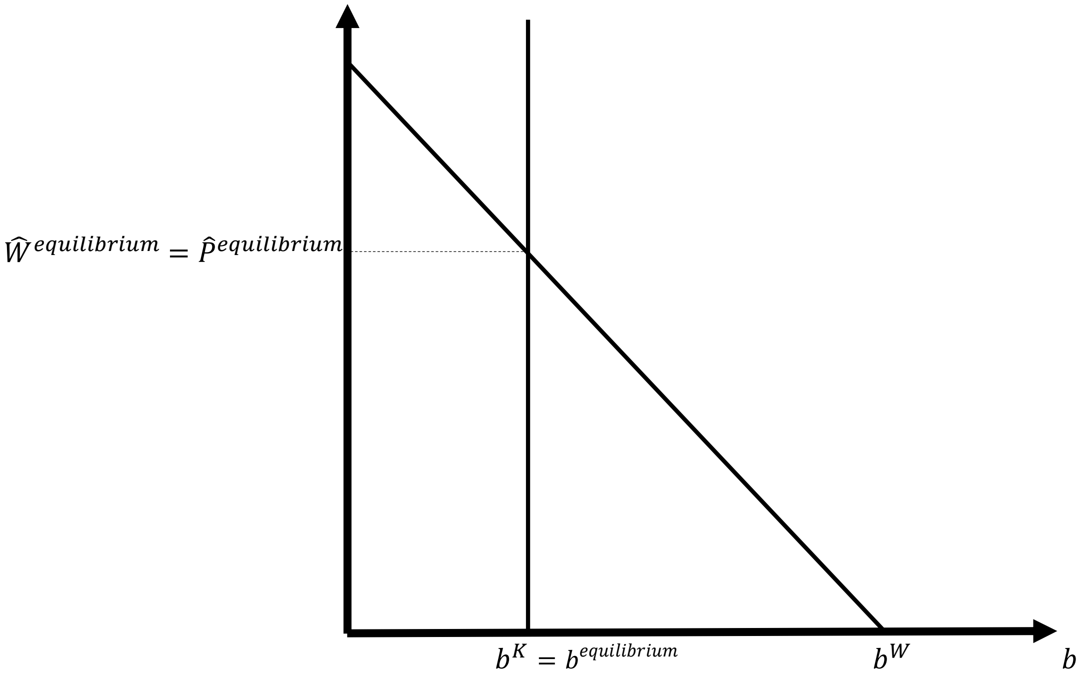

Figure 5. Equilibrium of the inflation rate and real wage in conflicting claims models when β^K is infinite and β^W is finite. Own elaboration.

Figure 5 shows that, in this extreme hypothetical configuration, the dynamics of wage and price adjustments converge to an equilibrium in which the effective real wage equals the firms' target real wage. Increases in workers' bargaining power or target real wage only raise the equilibrium inflation rate, without affecting the equilibrium real wage.

We can also represent graphically the opposite hypothetical situation, in which workers hold infinite bargaining power and firms' bargaining power is finite:

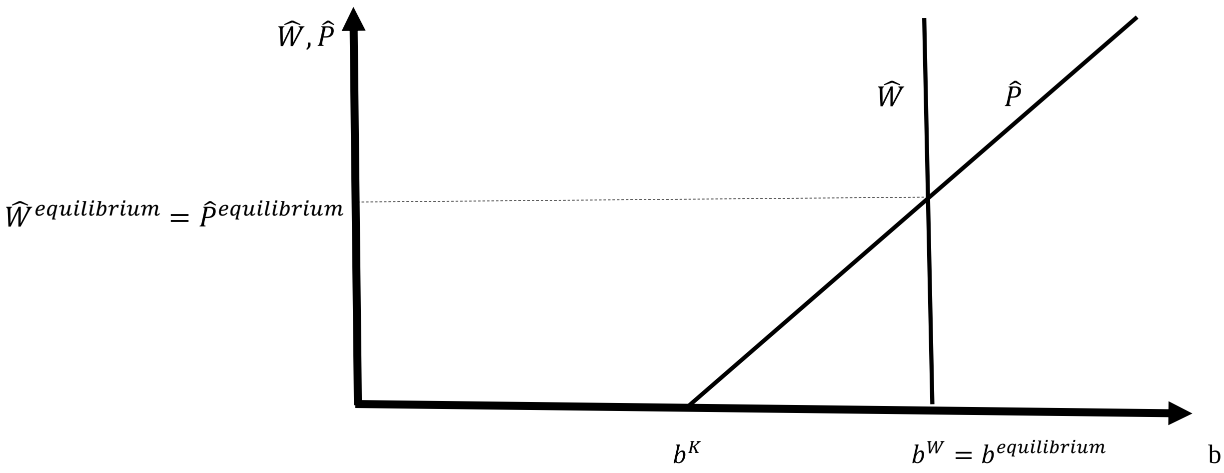

Figure 6. Equilibrium of the inflation rate and real wage in conflicting claims models when β^K is finite and β^W Is infinite. Own elaboration.

Figure 6 shows that, in this extreme hypothetical configuration, the dynamics of wage and price adjustments converge to an equilibrium in which the effective real wage equals the workers' target real wage. Increases in firms' bargaining power or reductions in their target real wage only raise the equilibrium inflation rate, without affecting the equilibrium real wage.

Finally, we can graphically illustrate the extreme analytical case in which both workers and firms have infinite bargaining power.

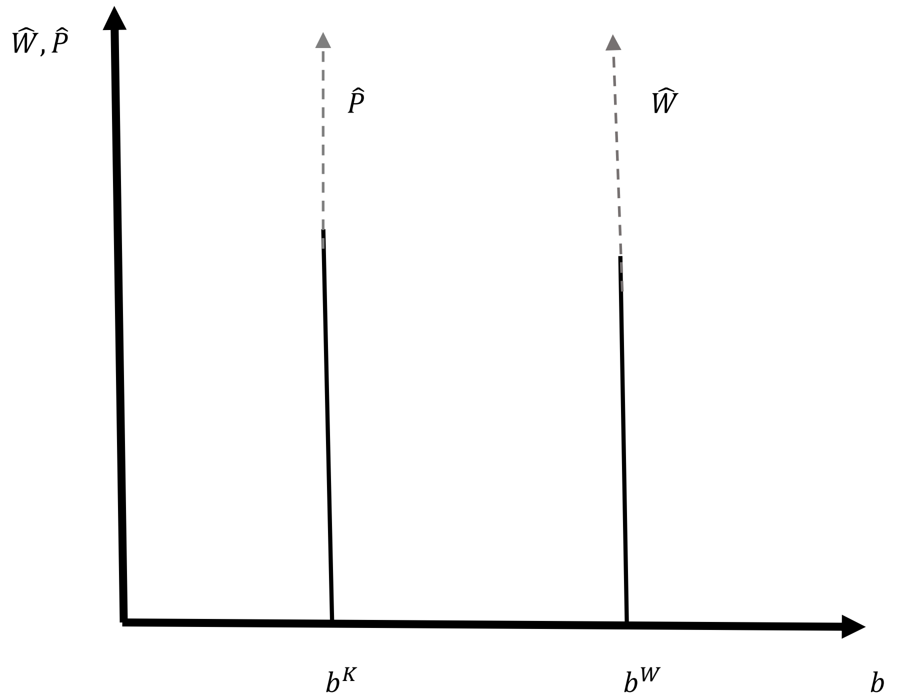

Figure 7. Conflicting claims models when β^K and β^W are infinite. Own elaboration.

Figure 7 shows that if both firms and workers have infinite bargaining power, the inflation dynamics do not converge to an equilibrium. Instead, price and wage growth rates increase without any limit.

In general, the literature considers that a more complete version of the model must include indexation parameters connecting price and wage adjustments to past inflation. In this case, additionally to the component that reflects the distance between the effective real wage and each class's target, these models assume that in a context of persistent inflation, adjustments become indexed to past inflation, weighted by a parameter that captures the "degree of indexation."[77] Price adjustments become indexed to wage increases from the previous period, and wage increases become indexed to price increases from the previous period.

[77] The concept of the degree of indexation in Conflicting Claims models differs from the one developed in the theory of inertial inflation. In inertialist models, each wage adjustment fully reflects the accumulated inflation over the previous period. However, because nominal wages remain fixed for a period of time, indexation is imperfect. In Conflicting Claims models, by contrast, the degree of indexation refers to the percentage of past inflation that

To incorporate indexation to past inflation into the conflicting claims equations, it is necessary to rewrite equations (1.3.5) and (1.3.6) as follows:

$$\hat{P} = \beta^k(b - b^k) + \alpha^k \widehat{W}_{t-1} \quad (1.3.A.9)$$

$$\widehat{W} = \beta^w(b^w - b) + \alpha^w \hat{P}_{t-1} \quad (1.3.A.10)$$

Where α^k is the degree of indexation of price adjustments to the previous period's wage growth, and α^w is the degree of indexation of wage adjustments to the previous period's price growth. Even with indexation included in the wage and price adjustment equations, when the bargaining power parameters (β^w e β^k) are finite and, at the same time, the degrees of indexation are less than one ($\alpha^w, \alpha^k < 1$), the inflationary process described by this dynamic converges to an equilibrium in both the inflation rate and the real wage – somewhere between the two target real wages – where $\hat{P}_t = \hat{P}_{t-1} = \widehat{W}_t = \widehat{W}_{t-1}$. This equilibrium is given by:

$$b^{equilibrium} = \frac{\left(\frac{\beta^w}{1-\alpha^w}\right)b^w + \left(\frac{\beta^k}{1-\alpha^k}\right)b^k}{\left(\frac{\beta^w}{1-\alpha^w}\right) + \left(\frac{\beta^k}{1-\alpha^k}\right)} \quad (1.3.A.11)$$

$$\hat{P}^{equilibrium} = \frac{\beta^w \beta^k (b^w - b^k)}{\beta^w(1-\alpha^k) + \beta^k(1-\alpha^w)} \quad (1.3.A.12)$$

From equations (1.3.11) and (1.3.12), which describe the model's equilibrium when indexation to past inflation is included, we observe that the equilibrium values of the real wage and inflation rate depend both on the indexation parameters and on the bargaining power parameters. As argued by Serrano, Summa, and Morlin (2024, p. 9), the higher the degree of wage indexation to prices, the higher the equilibrium real wage and the inflation rate. On the other hand, the higher the degree of price indexation to wages, the higher the inflation rate and the lower the equilibrium real wage.

These equations also allow for other possibilities in the extreme distributive outcomes. In this case, even when the bargaining power parameters (β^w and β^k) are finite, one of the target real wages (b^w or b^k) may be achieved if one indexation parameter equals 1 while the other remains below 1. That is, if the degree of wage indexation (α^w) equals one and the degree of price indexation (α^k) is less than one, the equilibrium real wage will equal the workers' target real wage. In the opposite case, if $\alpha^k = 1$ and $\alpha^w < 1$, the equilibrium real wage will equal the firms' target real wage.

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is incorporated into price and wage adjustments – if 100% is incorporated, the degree of indexation is 1; if less, the degree is below 1. Part of this difference in meaning stems from the fact that Conflicting Claims models do not deepen the analysis into the formalization of staggered price and wage adjustments. As a result, some relevant aspects of the evolution of real wages over time are omitted, altering both the meaning of indexation and its distributive effects.

However, in the hypothetical case where both α^w and α^k equal one, the inflationary dynamics described by the model do not converge to equilibrium. Analytically, this results in a hyperinflation dynamic, with an unlimited acceleration in the growth rates of prices and wages.

Therefore, it is important to highlight that the model converges to an equilibrium of inflation rate and a real wage between the targets of workers and firms only when β^w and β^k are finite and the indexation parameters α^w and α^k are both less than one, as discussed in Serrano, Summa, and Morlin (2024, p. 9).

1.3.A.2. Analytical Contributions and Problems of Conflicting Claims Models

a. Analytical Contributions

Among the analytical contributions of Conflicting Claims models, the first point to emphasize is their clarification of how distributive outcomes of the inflationary process can settle between the real wage targets of firms and workers. These models demonstrate that the hypothesis of one class achieving its target for real remuneration holds only under extreme assumptions for certain parameters – such as infinite bargaining power on the part of one class or full indexation to past inflation.[78]

It is also worth noting that the simplicity of the adjustment formalization based on the dynamics of conflicting claims over distribution, within a sufficiently broad approach, allows for the inclusion of potential exogenous variables that affect distributive incompatibility solely through deviations of the effective real wage from the real wage targets. This simple yet comprehensive formulation of adjustment dynamics contributes to the clarity in describing the functions that determine equilibrium levels of inflation and the real wage. Moreover, it helps identify the necessary conditions for the model to converge to equilibrium.

Finally, despite its reductionist simplification, the formalization of prices in a closed economy as a mark-up over wage costs enables a direct analysis of price dynamics through the lens of functional income distribution. In this context, the view of inflation as an expression of conflicting claims over distribution becomes more evident.

*b. **Analytical Problems***

[78] From a theoretical standpoint, the literature debates whether such extreme values represent realistic assumptions.

Among the analytical problems in Conflicting Claims models, the first that stands out is the lack of discussion on the inflationary and distributive effects arising from the interaction between two distinct price-setting processes – “Fix-Price” and “Flex-Price” – as discussed by Hicks (1974) and Serrano (1988). As a result, these models dedicate little space to explicitly addressing the possible effects of exogenous shocks that change relative prices on distributive incompatibility and on the inflation rate.

It should also be noted that in the version of these models without indexation components to past inflation, price and wage adjustments are implicitly assumed to occur simultaneously – either because the price is defined as a mark-up over replacement cost,[79] or because the adjustment equations do not include any specification regarding lag structures in the adjustment functions. This is an unrealistic representation of nominal adjustment dynamics, since in practice, changes in nominal remuneration tend to occur as agents react to real income losses caused by persistent increases in prices and wages during the period in which nominal remunerations remain fixed. A more realistic representation of wage and price adjustment dynamics should therefore include lags – both of price increases relative to wage increases, and vice versa.

Finally, in the version of these models that include indexation components, there is a relevant logical problem that seems to go unnoticed in the literature.[80] In equations (1.3.9) and (1.3.10), wage and price adjustments are modeled as if the indexation component to past inflation could be analytically separated from the deviation of the effective real wage from each class’s target. However, the inflation rate from the previous period directly determines the magnitude of the gap between the effective real wage and the targets. Therefore, these components must be represented in such a way that their impact is expressed exclusively as a variation in the magnitude of distributive incompatibility. In other words, on one hand, the effect of price increases in the period before the wage adjustment should be represented exclusively through the increase they generate in $(b^w - b)$; on the other hand, wage increases in the period before should be represented solely through the increase they generate in $(b - b^k)$. Thus, to ensure the model's internal consistency, it is necessary to rule out any formulation

[79] In other words, cost components are assessed at current prices, with no distinction made between this and the concept of historical cost.
[80] Except for Serrano, Summa, and Morlin (2024, p. 11), who indicate awareness of the issue but do not discuss it in detail – focusing instead on resolving the controversy between Hein (2023) on one side, and Lavoie (2022) and Blecker and Setterfield (2019) on the other, regarding the value of the degree of indexation through a reinterpretation of bargaining power parameters in the models. These authors also highlight that the introduction of indexation components in the Conflicting Claims model presentations is not fully explained in the main textbooks (Blecker and Setterfield (2019); Lavoie (2022); Hein (2023)).

that includes both a component for $(b^w - b)$ or $(b - b^k)$ alongside a second component for indexation to past inflation.

1.3.A.3. Conflicting Claims over Distribution, Frequencies of Adjustments, and the Conflicting Claims Model

To conclude this section, it is important to assess how Conflicting Claims models relate to the view of inflation as an expression of both distributive incompatibility and frequencies of price and wage adjustments.

First, as already discussed, it is worth emphasizing that the simplified general price-setting process assumed by these models in closed economy context establishes a direct and simple connection between prices and the functional distribution of income. As a result, the inflationary process described by the wage and price adjustment dynamics expresses a conflict in which the real wage and the real mark-up are inversely related. The assumption of distributive incompatibility between two real wage targets constitutes the very foundation of conflicting claims over distribution. Since price and nominal wage adjustments are formalized as functions of the gap between the effective real wage and the real wage targets, conflicting claims over distribution is the key explanatory factor in inflationary processes, with all equations and parameters of the model aligned with this perspective.

It should be noted that these models do not consider the frequency of price and wage adjustments as a relevant variable in explaining inflation dynamics. Although these models formalize a convergence process toward equilibrium in the adjustment dynamics, it does not explicitly account for the number of adjustments in each variable over given periods.[81] Thus, within this literature there is no integration between conflicting claims over distribution and adjustment frequency – except in Serrano, Summa, and Morlin (2024).

1.3.B. CAMBRIDGE ECONOMIC POLICY GROUP (CEPG) INFLATION THEORY

[81] Serrano, Summa, and Morlin (2024) reinterpret the Conflicting Claims model to incorporate frequency of adjustments. In their work, the parameters capturing each class's bargaining power to achieve its real wage target through price or wage adjustments are replaced by adjustment frequencies. However, there are no other examples of this procedure in the literature following the approach proposed by Dutt (1987). The theoretical connection between frequencies of adjustments and conflicting claims, as proposed by Serrano, Summa, and Morlin (2024), appears in Rowthorn (1977) and Okishio (1977), and is also compatible with inertialist and CEPG models.

This dissertation considers as models of the former Cambridge Economic Policy Group (CEPG) a set of analysis of inflation whose foundations align with the empirical and theoretical contributions originally developed by economists associated with the Department of Applied Economics at Cambridge. These contributions, formulated especially during the 1970s and 1980s, had significant influence on part of the literature focused on cost-push inflation models.[82] For the analysis developed in this section, the following are considered seminal and representative references of this theoretical perspective: Nordhaus, Godley (1972); Coutts, Tarling, Wilkinson (1976); Coutts, Nordhaus, and Godley (1978); Sylos-Labini (1979a, 1979b); Godley, Cripps (1983); Tarling, Wilkinson (1985).

In several aspects, these models developed and formalized theoretical elements often absent from the broader literature on cost-push inflation. For this reason, our discussion of CEPG models focuses on specific analytical aspects that are crucial for addressing some of the problems inherent in the other models discussed thus far. As in the previous sections, we identify a set of core analytical elements that form the theoretical foundation upon which the CEPG models build their analysis of inflation dynamics. The analytical core of these models consists of the integration of the following ideas:

(i) Conflicting claims over distribution is assumed as the basic cause of inflation;

(ii) Explicit analytical separation between nominal and real mark-up;

(iii) Explicit analytical separation between historical cost and replacement cost;

(iv) Assumption that prices are set by applying a nominal mark-up over historical cost (with some discussion of indexation mechanisms of the nominal mark-up);

(v) Imperfect indexation of the nominal mark-up (based on the notion that there is a time lag between increases in costs and their pass-through to prices);

(vi) As a consequence of (iii), (iv), and (v), there is a logical dissociation between the nominal mark-up and the real mark-up in an inflationary context – the real mark-up always falls during the time lag between price adjustments;

(vii) Given the existence of price adjustment lags, increases in average nominal wages temporarily raise the average real wage;[83]

[82] Note that, although these contributions were originally developed by authors connected to this department, the theoretical perspective extends beyond this group. Scholars from other institutions have also analyzed the inflationary process based on similar theoretical and empirical foundations. Notable theoretical developments from this literature can be found, for instance, in Frenkel (1979) and Dixon (1983).

[83] The empirical argument that nominal wage increases above productivity are only partially passed on as price increases in a given period (Sylos-Labini (1979a)) supports the argument described, since nominal wage inflation generates real wage gains – an outcome that can be theoretically justified by the existence of a time lag.

(viii) Shorter intervals between nominal wage adjustments lead to an increase in the real wage and a decrease in the real mark-up (as long as there is no exactly offsetting reduction in the lag of price adjustments);

(ix) Since there are time lags in both price and wage adjustments, conflicting claims' outcome of the cannot be determined *a priori*: the effective real wage settles between the targets of firms and workers;

(x) Simultaneous shortening of both price and wage adjustment intervals increases the inflation rate.

Based on the analytical core described above, we begin presenting a stylized version of the CEPG model, following the theoretical aspects developed by the references mentioned.

1.3.B.1. Basic Model

The basic and distinctive starting point of this literature lies in the set of assumptions related to firms' price-setting behavior. As discussed in detail by Nordhaus and Godley (1972); Coutts, Godley, and Nordhaus (1978); Godley and Cripps (1983); and Tarling and Wilkinson (1985), two cost components must be identified, each corresponding to different points in time: (i) the historical cost, which consists of the unit direct cost of production evaluated at the prices prevailing when the various components were acquired or contracted (input and nominal wages); (ii) the variation in unit direct cost during the time interval between the rise in the prices of these components (inputs and nominal wages) and the subsequent pass-through to final prices.

Accordingly, the distinctive assumption of CEPG models is that there is a time lag between cost increases and their pass-through to prices. This assumption leads to a logical consequence: the mark-up is applied over historical cost, and the additional cost component necessarily results in a decline in the real mark-up – which is always lower than the nominal mark-up[84] applied over historical cost in inflationary contexts.[85]

[84] The nominal mark-up is established when "output price is set by taking a constant percentage over average normal historical current cost.' […] We assume firms use historical cost pricing, with the cost base equal to the sum of costs of different inputs, the cost of each category calculated at time of purchase" (Nordhaus, Godley, 1972, pp. 854–855). This passage is also referenced in Lavoie (2022, p. 169).

[85] Simply put, if we denote "n" as the nominal mark-up and "m" as the real mark-up, we can follow Serrano (2010, p. 397) and represent these two concepts as follows:

(i) Price as a nominal mark-up over historical cost: $P = (1 + n).u_{t-1}$, where u is the unit direct cost and t - 1 indicates the previous period.

(ii) Price as a real mark-up over replacement cost: $P = (1 + m).u$, here u is the unit direct cost.

Given that these models interpret inflation as an expression of conflicting claims over distribution, the dynamics of price and nominal wage adjustments reflect the basic logic in which firms raise prices in pursuit of their target real mark-up (by reducing the real wage), and workers raise nominal wages to achieve their target real wage. In closed economies, these models often adopt the simplification that the unit direct cost consists solely of wage costs (as in the Conflicting Claims models for closed economies). Thus, we can formalize the assumptions presented and the underlying relationships between inflation and functional income distribution.

Consider a time period that starts when price is set and ends when that price is adjusted (increased). Let: Lag_p is the time lag between a wage increase and the subsequent price increase; Lag_w is the time lag between a price increase and the subsequent wage increase; Ψ is the share of the full period (from one price increase to the next) during which prices lag behind wages;[86] W_t is the wage bill at the beginning of the period, when prices are set; W_{t+1} is the wage bill at the end of the period, just after the nominal wage increase (assuming wage growth exceeds productivity growth); n is the nominal mark-up; m is the real mark-up; t is the length of the full adjustment cycle between one price increase and the next.

Using these variables, we can follow Tarling and Wilkinson (1985, p. 180) to describe the factors that determine the average real mark-up across periods:

$$m = \frac{(1-\Psi)W_t.n+\Psi[W_t.n-(W_{t+1}-W_t)]}{[(1-\Psi)W_t+\Psi.W_{t+1}]} \qquad (1.3.B.1)$$

The average real mark-up over a reference period, described by equation (1.4.1), follows a sequence of events: initially, when the price is set, the wage bill is W_t, and both the real and nominal mark-up equal $n.W_t$.[87] Once wages increase – ending the portion of the period corresponding to (1 – Ψ) – the real mark-up declines during the remainder of the interval, until the next price adjustment starts a new period. Equation (1.4.1) highlights a key point: the real mark-up is a decreasing function of Ψ (and thus also of Lag_p) and of the magnitude of the wage bill increase ($W_{t+1} - W_t$).

Figure 8, based on Tarling and Wilkinson (1985), illustrates this dynamic between time lags, real mark-up, nominal mark-up, and cost increases (simplified as wage costs).

[86] $\Psi = \frac{Lag_p}{(Lag_w+Lag_p)}$, so that, consequently, $0 \leq \Psi \leq 1$.

[87] If wages remained unchanged throughout the period, then the real mark-up would equal the nominal profit margin during the entire period ($m = n$).

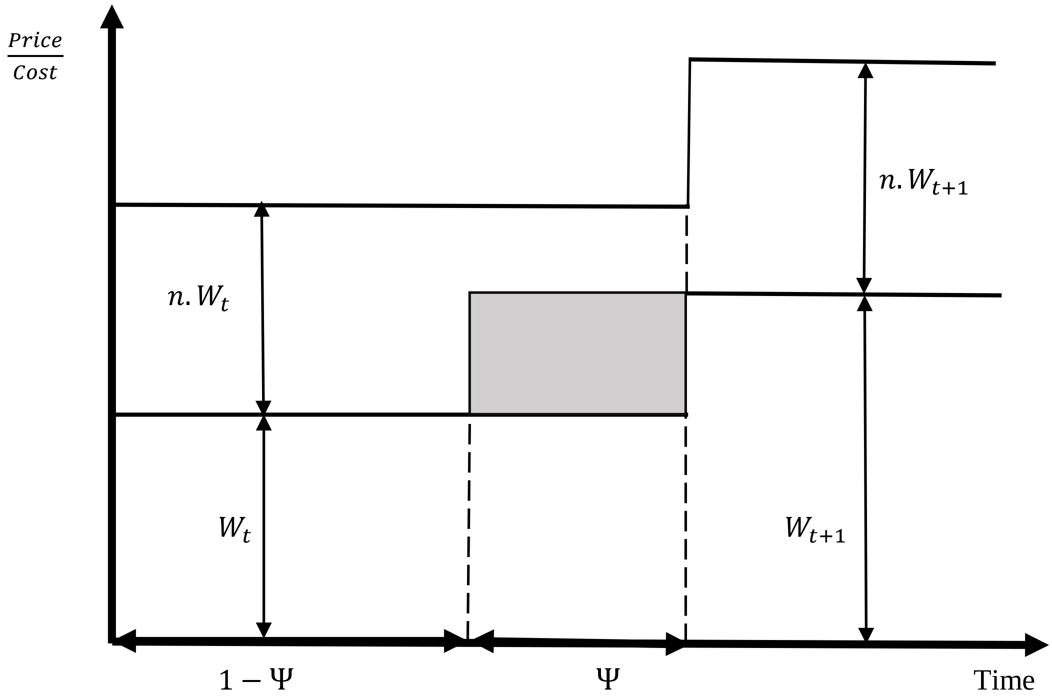

Figure 8. Real Mark-up over the Average Interval Between Price Adjustments. Own Elaboration.

Equation (1.4.1) makes clear the dissociation between nominal and real mark-up: when nominal wages increase within the interval between price adjustments, then m < n, with the gap determined by the nominal wage growth rate and the duration of the lag Ψ. Considering that, by definition, $\widehat{W} = \frac{W_{t+1}-W_t}{W_t} = \frac{W_{t+1}}{W_t} - 1$, it is possible simplify equation (1) as:

$$m = \frac{n-\Psi.\widehat{W}}{1+\Psi.\widehat{W}} \qquad (1.3.B.2)$$

Equation (1.4.2) shows that when nominal wages rise:

$m < n,\ \frac{\partial m}{\partial \Psi} < 0$, e $\frac{\partial m}{\partial \widehat{W}} < 0.$

As inflation accelerates, the firm's costs increase. Thus, if firms aim to achieve a target real mark-up, the pricing process must be adjusted. More precisely, firms need to include an additional component in the pricing rule, beyond the nominal mark-up over historical cost. Given the time lag between production cost increases and price adjustments, the way firms have achieve a target real mark-up (m^*), is by applying the nominal mark-up over two cost components: (i) the historical cost, and (ii) the variation in costs within the period. In this case, for firms to meet their target, the nominal mark-up must be applied as follows:

$$m^* W_t = n[W_t + \Psi(W_{t+1} - W_t)] \qquad (1.3.B.3)$$

Dividing both sides by W_t yields:

$$m^* = n(1 + \Psi.\widehat{W}) \qquad (1.3.B.4)$$

Equations (1.4.3) and (1.4.4) show that the nominal mark-up is applied over an average value of the unit direct cost over the considered period, which corresponds to what Coutts, Godley, and Nordhaus (1978, p. 36) refer to as "average cost pricing".[88] Equation (1.4.4) also shows that achieving the desired target real mark-up m^* requires prior knowledge of both the future wage increase ($\widehat{W}$) and the lag Ψ. However, if a firm incorrectly anticipates the future cost increase (for example, underestimates $\widehat{W}$), its immediate recourse would be to shorten Lag_p and adjust its prices more quickly. In the extreme case where firms can adjust prices at any time, prices could be set through full indexation of "n", with instantaneous adjustment to cost increases ($\Psi = 0$) – thus setting prices through a real mark-up over replacement cost.

Regarding the dynamics of conflicting claims over distribution inherent in the inflationary process described, one aspect remains unaddressed. The notion that one class can unilaterally achieve its real remuneration target rests on the often implicit assumption that the other class does not respond in an inflationary context by shortening its own adjustment lags.[89] As discussed above, if the opposing class reacts by reducing its own lag in nominal wage or price adjustment, then the real mark-up (and the real wage) would remain between the targets of workers and firms.

From the model presented, a crucial conclusion emerges: the outcome of the conflicting claims cannot be determined *a priori*. In the terms of the stylized model described – where wages are the only cost component and the economy is closed – three hypothetical outcomes exist: (i) workers succeed in achieving their real wage target; (ii) firms succeed in achieving their real wage target; (iii) neither side achieves its target, and both must accept a loss. However, since the assumption of zero time lag in nominal remuneration adjustment relative to inflation is unrealistic, outcomes (i) and (ii) do not occur in practice. Therefore, distributive variables settle within the range between the real wage targets.

1.3.B.2. Analytical Contributions and Problems of CEPG Models

[88] According to these authors, the approach to price-setting through "average cost pricing" represents an intermediate case between the extremes of real mark-up over replacement cost and nominal mark-up over historical cost.

[89] This is an unrealistic assumption because, as one class adjusts its nominal remuneration and reduces the real remuneration of the opposing class, the inevitable consequence – in an inflation dynamic driven by conflicting claims – is that those who suffered losses try to shorten the period during which nominal wages remain fixed (that is, the expected reaction against inflation acceleration is an increase in the degree of indexation). Godley and Cripps (1983, p. 203) associate higher inflation rates with increased nominal wage indexation: "At high rates of inflation, particularly if they persist for long, indexation by one device or another will become increasingly pervasive and effective".

a. Analytical Contributions

Among the analytical contributions of the CEPG framework, the first that stands out is the rejection of the assumption of perfect indexation of the nominal mark-up through the notion of price-setting based on historical cost. By not describing price-setting as the application of a mark-up over replacement cost, this approach opens up the possibility of obtaining realistic distributive outcomes of inflation. Furthermore, this perspective appears to align more closely with empirical observations, as discussed in Sylos-Labini (1979; 1982) – key empirical studies that argue for only partial pass-through of cost increases to prices.

It is worth noting that the explicit introduction of a time lag between cost increases and price adjustments marks an analytical advance absent from all other inflation models discussed in this dissertation. This feature distinguishes CEPG models and provides greater clarity even in evaluating some of the seemingly implausible outcomes of other important models within the cost-push inflation literature.

Finally, although not a central focus of this literature, the inclusion of lags allows for a clearer understanding of the analytical role played by the shortening of price and wage adjustment intervals in increasing the inflation rate. In this sense, it becomes implicit that the inflation rate resulting from the dynamics of conflicting claims over distribution depends not only on the distance between the real wage targets of firms and workers but also on the adjustment frequencies of each class.

b. Analytical Problems

Despite the contributions developed by CEPG models, some analytical elements rely on simplifications that overlook important aspects of inflation dynamics and equilibrium. In particular, the simplified version presented reduces cost components to wage bill costs – just as in the Conflicting Claims models – thereby omitting input costs and, consequently, the inflationary effects of key variables associated with changes in relative prices due to exogenous shocks to specific price groups. In other words, there is no in-depth discussion of the potential analytical role of the coexistence of “Fix-Price” and “Flex-Price” mechanisms as proposed by Hicks (1974).

Another important point is that, since these models focus on the “pure mechanics” of the inflationary process, they do not seek to explain changes in the inflation rate through exogenous variables. The terms of the conflicting claims over distribution – i.e., the gap between real wage targets – are taken as given. As a result, the models do not incorporate the effects of exogenous variables that could influence the magnitude of distributive incompatibility. This omission stems, in part, from the fact that conflicting claims over distribution are treated as an assumption. Thus, this literature does not focus on investigating the possible factors that could intensify or mitigate the conflicting claims.

1.3.B.3. Conflicting Claims over Distribution, Frequencies of Adjustments, and the CEPG Model

To conclude this section, it is important to assess how CEPG models relate to the perspective of inflation as an expression of both distributive incompatibility and the frequencies of nominal price and wage adjustments.

As already discussed, it is important to highlight that conflicting claims over distribution is assumed, from the outset, to be the fundamental cause of the inflationary process described by autonomous increases in nominal wages and prices. In this framework, conflicting claims are always the explanatory factor behind persistent inflationary processes. There is no consideration of the possibility that inflation could reflect a purely inertial dynamic or result solely from changes in relative prices, without any distributive implications.

In this literature, the adjustment frequencies of prices and wages – analyzed in terms of the time lags between adjustments – play a central analytical role. However, these frequencies are fully embedded in the dynamics of conflicting claims over distribution. The discussion on the periodicity of adjustments focuses on their distributive implications, rather than aiming to formally determine equilibrium inflation levels. Accordingly, the emphasis lies in the determination of the real mark-up (and, by extension, the real wage) and in understanding how this variable relates to the inflation rate itself.

Finally, it is important to note that these models do not provide an analytical role for exogenous variables that change relative prices and affect the functional income distribution (by increasing or decreasing the intensity of conflicting claims over distribution). Therefore, these models do not explain inflation through exogenous shocks on relative prices.

1.4. SYNTHESIS: RELATIVE PRICES, CONFLICTING CLAIMS, FREQUENCIES OF ADJUSTMENTS AND INERTIA

The four groups of models analyzed in this chapter offer a set of important theoretical contributions. In light of the discussion, it becomes clear that a consistent inflation model must be capable of representing the dynamics of both the inflationary process and conflicting claims over distribution in a way that incorporates the various contributions examined, within a sufficiently comprehensive theoretical formalization – without repeating the analytical shortcomings previously discussed.

Drawing on the foundations obtained from the models analyzed, it is possible to construct a theoretical synthesis that serves as basis for understanding the dynamics associated with price-wage spirals. This synthesis requires, as a basic theoretical core, the analytical articulation of four central and interdependent elements in inflationary contexts: (i) exogenous variations in relative prices; (ii) conflicting claims over distribution; (iii) frequencies of adjustments; and (iv) inertia (which is explainable by conflicting claims and frequencies of adjustments). The coherent integration of these elements is essential for developing robust analyses of inflation.

In this sense, the theoretical formalization of the model must be broad enough to allow for the understanding and representation of both the inflationary and distributive effects of shocks that change relative prices and change the magnitude of distributive incompatibility (the gap between real wage targets). It must also clearly demonstrate the importance of nominal remunerations indexation to past inflation in persistent inflationary contexts, as a response by agents seeking to resist losses in real remuneration caused by the general increase in prices and wages. Hence, the model should also highlight the role of indexation in creating rigidity within the relative price system.[90] Finally, through the dynamics of price and wage adjustments driven by conflicting claims over distribution, a consistent cost-push inflation model must be able to demonstrate analytically that both firms and workers can achieve real income gains through nominal price and wage increases. In this context, a distributive configuration in which one class has full power to achieve its real remuneration target is a special case. The general case is one in which remuneration settles between the targets.

Among the analytical elements of the models discussed, the following are considered essential for a consistent cost-push inflation theory:

(i) Explicit association between prices and the functional income distribution.

(ii) Disaggregation of the price-setting into two distinct sectors: (a) a “Flex-Price” sector and (b) a “Fix-Price” sector.

[90] In this case, maintaining a given configuration of relative prices in an inflationary context requires specifying a particular indexation system, since in such a context, the hypothesis of not adjusting prices according to inflation necessarily implies changes in relative prices.

(iii) Existence of an inverse relationship between the real mark-up and the real wage.

(iv) Explicit analytical separation between nominal and real mark-up.

(v) Explicit analytical separation between historical cost and replacement cost.

(vi) Prices in the "Fix-Price" sector are set by applying a nominal mark-up over historical cost (and some specification about the nominal mark-up indexation must be considered).

(vii) Price and nominal wage adjustments tend to follow some form of indexation to previous period's accumulated inflation.

(viii) The indexation of nominal variables to past inflation functions as a mechanism for the protection of real income against inflation-induced losses.

(ix) As the number of nominal adjustments per period increases (i.e., the frequency of adjustment increases), the degree of indexation also increases.

(x) The more indexed nominal remunerations are, the higher the inflation resulting from exogenous shocks on relative prices.

(xi) The equilibrium in the functional income distribution is, in general, established between the targets of workers and firms.[91]

(xii) Nominal wage and price adjustments are staggered and unsynchronized over any given time frame.

(xiii) When inflation is positive, any time interval in which a nominal remuneration remains constant corresponds to a continuous period of erosion in real income caused by the general increase in prices.

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[91] The hypothesis that distributive outcomes are unilaterally determined by one income class requires the unrealistic assumption of perfect indexation – meaning that either prices adjust instantly to any minimal change in production costs (without time lag), or nominal wages adjust instantly to any rise in the general price level (without time lag).

CHAPTER 2: THREE PERSPECTIVES ON THE ANALYTICAL ROLE OF THE EXCHANGE RATE IN INFLATION DYNAMICS

2.1. INTRODUCTION

This dissertation argues that a consistent inflation model must be able to represent the inflation dynamics by integrating the analytical contributions discussed thus far. However, the previous chapter omitted the potential influence of the exchange rate on the dynamics of price and wage adjustments. In light of that omission, the present chapter aims to broaden the analysis of inflation to the context of an open economy. Accordingly, it begins by assessing the specific analytical role of the exchange rate (both nominal and real) in three of the four groups of cost-push inflation models discussed in Chapter 1: (i) structuralist models, (ii) inertialist models, and (iii) conflicting claims models.[92] The analysis focuses on the interrelations among exchange rates, conflicting claims over distribution, and the frequency of price and wage adjustments. Among the various topics covered by these models, we summarize those contributions that, in our view, are essential to analyzing inflation in the open economy context.

Extending the analysis of inflation to the open economy is justified by the prominent role played by the nominal exchange rate as an explanatory variable for inflation dynamics – and for successful stabilization programs – in a wide range of economies. This is documented by several empirical studies, including: Vernengo and Perry (2018); Bastos, Bastian, and Bielschowsky (2022); Yusifada, Comert, and Parmaksiz (2024); Trajtenberg, Valdencantos, and Vega (2015); Palazzo, Rapetti, and Waldman (2025). Moreover, incorporating the nominal exchange rate into inflation analysis is also relevant for understanding the processes that generate hyperinflationary dynamics. In cases of persistent balance of payments problems, successive rounds of nominal exchange rate depreciation combined with accelerating inflation may trigger an accelerationist nominal exchange rate-price-wage spiral – as analyzed in Merkin (1986); Franco (1986, 1987); Lopes (1989); Bastos and Willcox (2001); Bastos (2002).[93]

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[92] In the critical literature review, the analytical contributions identified in the works of the CEPG authors do not form a significant foundation for the analysis proposed here. Accordingly, they were not included in this dissertation. This exclusion, however, should not be interpreted as indicating that the CEPG authors made no contributions to the analysis of inflation in open economies. Relevant examples can be found in Coutts, Godley, and Nordhaus (1978) and in Wilkinson (2000). Kaldor, whose work influenced the CEPG authors, also made contributions in this literature, including Kaldor (1976, 1987).

[93] Sargent (1982), Bomberger and Makinen (1983), and Cagan (1956) also recognize the accelerationist dynamics of inflation and nominal exchange rate depreciation in hyperinflation contexts. However, in their analyses, inflation is understood strictly as a monetary phenomenon, attributed to excess money supply, while exchange rate depreciation is explained by the Purchasing Power Parity (PPP) theory. For a more detailed presentation of the

2.2. THE EXCHANGE RATE IN STRUCTURALIST MODELS

Understanding the analytical role of the exchange rate in structuralist models of inflation requires a review of some of the basic foundations of this theoretical framework. As discussed in Chapter 1, inflation from a structuralist perspective is explained by the coexistence of two elements: (i) inflationary pressures (which generate relative price changes), and (ii) propagation mechanisms (which consist of a process of price and wage adjustments driven by conflicting claims over distribution).

In general, inflationary pressures are understood as the result of sectoral demand excesses, which appear as localized imbalances in two key sectors: (a) international trade and (b) agriculture.[94] External pressure is usually explained by a trajectory in which export growth persistently falls short of import growth, leading to balance of payments deficits and sustained pressure on the nominal exchange rate – producing a tendency toward chronic exchange rate depreciation. On the other hand, internal inflationary pressure is explained by the inability of a given productive sector – the literature typically associates this sector to agriculture – to expand supply in line with the trend in effective demand for its products. In this case, the adjustment between rigid supply and rising demand occurs through rising market prices.[95]

As discussed in the previous chapter, the first central theoretical element in structuralist models necessary for understanding the logical connections between inflationary pressures and the general rise in prices is the disaggregation of pricing across two distinct sectors: (a) a "Flex-Price" sector and (b) a "Fix-Price" sector.[96] The recognition of distinct pricing mechanisms allows inflationary pressures to produce changes in relative prices across different groups of commodities. The logic begins with inflationary pressures that raise prices in the "Flex-Price"

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logic behind nominal exchange rate determination by PPP theory, see Gandolfo (2016, pp. 333–334) and Cassel (1918).

[94] Note, however, as argued by Malan and Wells (1982, p. 10), that the logic of the structuralist theory of inflation, when properly understood, does not depend on the assumption of excess sectoral demand (or supply rigidity in any specific sector), whether external or internal. It is sufficient that exogenous variables unrelated to sectoral demand excesses raise prices in any sector for the "inflationary pressures" logic of the structuralist theory to take hold. An example of price variations in a sector not caused by excess sectoral demand would be an increase in government-administered prices, as discussed in Braga and Summa (2016) and Rozenwurcel (1985).

[95] In the long run, however, the increase in the profit rate associated with such price rises in flexible-price sectors acts as a signal for supply adjustment. This long-term supply adjustment causes prices even in the "Flex-Price" sector not to be determined by demand, as argued by Serrano (1988, pp. 63–65).

[96] In the previous chapter, we highlighted that the structuralist literature does not attempt to explain the logic underlying the two distinct price formation processes. Therefore, to provide theoretical consistency to this approach, we should base our analysis on the discussions in Hicks (1974, pp. 22–30) and Serrano (1988, pp. 63–65), considering that these distinct price determination processes stem from the existence of two different supply adjustment mechanisms to demand in the short run, across different market structures.

sector, thereby shifting relative prices ($\uparrow \frac{P_{Flex}}{P_{Fix}}$).[97] The implications of these relative price changes for the functional income distribution are critical for understanding the inflationary process. This is because production processes across sectors are interdependent,[98] and rising prices in one group increase production costs in sectors that use those goods as inputs – while also reducing real wages.

Given the relative price changes triggered by inflationary pressures, the second core theoretical element in the structuralist explanation of inflation refers to the propagation mechanisms of such pressures. These mechanisms, as discussed in the previous chapter, consist of nominal price and wage adjustments in response to changes in relative prices. The logic behind these adjustments is rooted in conflicting claims over distribution, as different income appropriators raise their nominal remunerations in response to real income losses caused by initial shifts in relative prices.

To assess the analytical role of the exchange rate specifically within structuralist models of inflation, it is necessary to explore how this variable affects prices through both inflationary pressures and propagation mechanisms.[99] While this literature generally agrees that nominal exchange rate depreciation is an important inflationary factor, there are distinct approaches among authors regarding the specific channels linking the nominal exchange rate to prices. Several of these analytical contributions offer important insights for understanding how the nominal exchange rate impacts relative prices, functional income distribution, and inflation. In what follows, we first discuss the most widely accepted points, and then examine the more specific approaches.

To begin with, the first group of goods whose prices are perceived as directly influenced by the nominal exchange rate are the imported goods.[100] The logic of this direct influence is simple: the prices of imported goods are set exclusively in international markets and in U.S. dollars (as the reference international currency). Thus, the price of imported goods in domestic currency is given by:

$$P^M \coloneqq e.P^{M*} \tag{2.2.1}$$

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[97] It is important to highlight, as argued by Malan and Wells (1982, p. 3), that structuralist analyses consider various possible groups of goods whose relative prices change (for example: agricultural/industrial, tradables/non-tradables, exported/imported goods, etc.).

[98] As argued by Kaldor (1976) and Malan and Wells (1982).

[99] Olivera (1967) explicitly states that his formalization of the interactions between relative price changes and propagation mechanisms can be applied to the external sector: "*La generalización del análisis precedente al caso de sectores múltiples, incluyendo el sector externo, puede hacerse sin dificultades.*" (Olivera, 1967, p. 266).

[100] Among the authors who explicitly emphasize these goods as relevant for explaining the impacts of nominal exchange rate depreciations are: Noyola Vázquez (1956, pp. 166–167); Sunkel (1958, pp. 583–584); Pazos (1949, p. 403); Malan and Wells (1982); Baer (1967).

Where P^M is the domestic-currency price of the imported good, e is the nominal exchange rate, and P^{M*} is the dollar price of the imported good. According to (2.1), either a depreciation of the nominal exchange rate ($\uparrow e$) or an increase in the dollar price of the imported good ($\uparrow P^{M*}$) leads to a higher domestic-currency price of that good ($\uparrow P^M$).

Note that this same reasoning applies to domestically produced goods that are also exportable and priced in international markets. Accordingly, tradables – goods that can be traded internationally, either imported or exported – constitute a broader set of goods. As a result, extending this logic to tradables[101] offers a more comprehensive framework. The domestic-currency price of tradables is determined as follows:

$$P^T \coloneqq e.P^{T*} \qquad (2.2.2)$$

As an immediate consequence of (2.2.2), any depreciation of the nominal exchange rate ($\uparrow e$) or increase in the average dollar price of the tradable good ($\uparrow P^{T*}$) raises the average price of the tradable good in domestic currency ($\uparrow P^T$). Thus, in open economies, the initial effect of a nominal exchange rate depreciation should be understood through the change in relative prices between tradables and non-tradables ($\uparrow \frac{P^T}{P^N}$), where P^N denotes the average price of non-tradable goods in domestic currency.[102]

Given the distinction between tradables and non-tradables, we can follow Hicks (1974, pp. 29–30) and associate, under floating exchange rate regimes, tradable goods with the "Flex-Price" sector and non-tradables with the "Fix-Price" sector. Accordingly, the entire logic of the inflationary and distributive mechanisms analyzed and represented by equations (1.1.1) to (1.1.21) in Chapter 1 applies here. In open economies with floating exchange rates, variations in the nominal exchange rate become the cause of the initial relative price changes, and the subsequent inflationary dynamics follow the logic already discussed in the previous chapter.

This section presents specific details and logical considerations to reinforce the argument. Given the interdependence between productive sectors and, consequently, between prices, there is a basic mechanism through which nominal exchange rate variations affect both prices and the functional income distribution: costs. Considering the disaggregation of goods into the two sectors described, it is evident that nominal exchange rate depreciation increases costs by raising

[101] For the sake of simplicity, we assume that all tradable goods are price takers.
[102] For the sake of internal consistency in this dissertation, we will work with this idea using the distinction between tradables and non-tradables to represent the separation between "Flex-Price" and "Fix-Price," with emphasis on the nominal exchange rate as a decisive variable. Hicks (1974, pp. 29–30) notes that in an open economy with a floating exchange rate, internationally traded goods (i.e., tradables) become "Flex-Price." However, it is important to highlight that most of the structuralist literature develops the same logic using the distinction between imported goods and domestically produced goods.

the prices of tradable goods and, as a result, induces price adjustments in the non-tradable sector. Formally, prices in the Fix-Price sector are described as:

$$P_{Fix} = (1+m)[\frac{W}{B} + \frac{P_A}{a} + e.\frac{P_A^*}{a^*}] \quad (2.2.3)$$

Where P_{Fix} is the price in the "Fix-Price" sector; m is the real (flexible) mark-up;[103] W is the average nominal wage (per hour of labor contracted); B is the technical coefficient of output per unit of labor ($\frac{Q}{L}$); a is the technical coefficient of domestic (non-tradable) inputs required per unit of output ($\frac{Q}{A_i}$); P_A is the average price of non-tradable inputs used in production; e is the nominal exchange rate; a^* is the technical coefficient of inputs that are tradable goods; and P_A^* is the average dollar price of tradable inputs used in production.

Moreover, nominal wages are assumed to be a positive function of agricultural prices, which in turn are positively influenced by the nominal exchange rate – since part of agricultural goods are tradable, and the prices of tradables are determined by equation (2.2.2). Thus:

$$W = f(P_{Agricultural}) \quad (2.2.4)$$

$$\frac{\partial W}{\partial P_{Agricultural}} > 0$$

$$P_{Agricultural} = f(e) \quad (2.2.5)$$

$$\frac{\partial P_{Agricultural}}{\partial e} > 0$$

Equations (2.2.2) – (2.2.5) show that depreciation of the nominal exchange rate raises the prices of tradable goods and, consequently, increases the prices of all goods that use tradables as production inputs – and also increases nominal wages. These increases in prices and nominal wages resulting from the rise in P^T are reactions by firms and workers against declines in their real remuneration (real mark-up and real wage).

It is important to note that a key condition must be met for the relative price variation ($\uparrow \frac{P^T}{P^N}$) caused by nominal exchange rate depreciation to generate generalized inflation: tradable goods must be used in the production of other goods and must also be part of workers' consumption baskets, whether directly or indirectly.[104] If this condition is not met, the depreciation of "e" will only raise P^T without having any effect on P^N or W.

[103] The structuralist literature does not address the distinction between nominal and real mark-up. However, in this case, we chose to represent the price-setting process in the "Fix-Price" sector through a flexible real mark-up under inflationary conditions, to ensure consistency with the approach implicitly assumed in Olivera (1967) and Canavese (1982). In the model, the real mark-up varies under inflation according to a parameter that captures the degree of flexibility of this variable, as discussed in Chapter 1.

[104] Pazos (1949) uses the concepts of "essential goods" and "luxury goods" to express this idea.

Some authors identify a decoupling between the paths of the nominal and real exchange rates under inflationary conditions.[105] Logically, this decoupling is inevitable due to the very definitions of the variables. Since the real exchange rate is defined as $e_r = \frac{e.P^*}{P}$, its dynamic form is:

$$\widehat{e_r} = \hat{e} + \hat{P}^* - \hat{P} \tag{2.2.6}$$

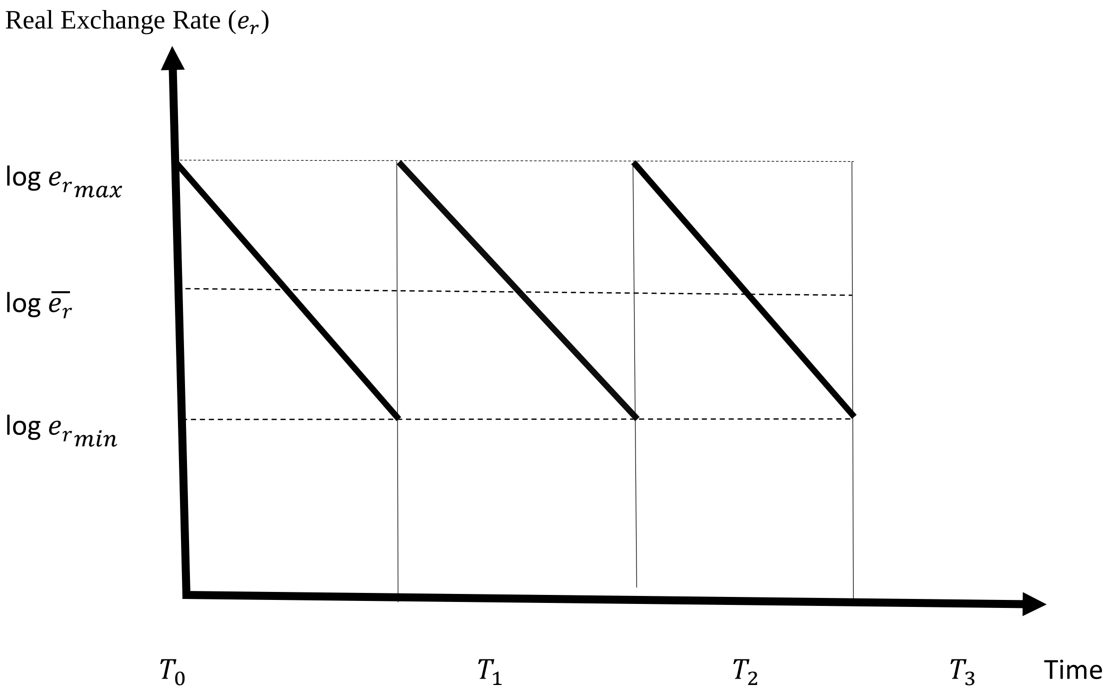
Based on the structuralist theory and all the mechanisms discussed that justify the influence of $\hat{e}$ on $\hat{P}$, we can explain a very particular pattern in the trajectory of the real exchange rate during nominal depreciations. Assuming a constant $\widehat{P^*}$ (for the sake of analytical simplicity), an increase in "e" causes both the nominal and real exchange rates to depreciate at the moment it occurs, since the entire sequence of reactions – namely, price increases in non-tradables and nominal wage adjustments – does not happen fully and instantly. However, in the time interval during which "e" remains constant (after depreciating), the prices of non-tradables and wages tend to rise, so that the real exchange rate e_r appreciates.

In the context of high and stable inflation, Pazos (1963) points out that periodic depreciations of "e" play a role in avoiding the appreciation of e_r. In the author's words:

> Spiral processes require frequent exchange rate adjustments to align the external price level with the rising internal price level. The adjustment is carried out in more or less gradual and frequent steps, or in large and spaced-out stages, depending on the country's style and historical period, but it tends, as a general rule, to be delayed. (Pazos, 1963, p. 615).[106]

A consequence of this real exchange rate trajectory is that attempts to devalue e_r through nominal exchange rate depreciation may fail, since $\hat{e}$ accelerates $\hat{P}$, meaning e_r may resist rising its average value between rounds of nominal depreciation – depending on the strength of the price and wage responses. The trajectory of e_r in the context of a nominal exchange rate-price-wage spiral with successive rounds of "e" depreciation and positive domestic inflation ($\hat{P}$) resembles the trajectory of the real wage in inertialist inflation models.[107] This can be represented graphically as follows:

[105] Among the works that address this dissociation, notable examples include: Pazos (1963), Pazos (1977), Malan and Wells (1982), and Baer (1967).
[106] Own translation.
[107] Referred to as the "Simonsen-Pazos Mechanism" by Dornbusch (1986, pp. 7–10).



Graph 9. Trajectory of the real exchange rate between nominal exchange rate adjustments under constant inflation. Own elaboration.

Pazos (1977) provides a coherent explanation for the persistence of the inflationary process characterized by similar trajectories of certain real variables, such as those discussed for real wages and the real exchange rate. According to the author:

> Inflationary impulses are transmitted from one period to the next through expectations and through the leap-frogging of prices that are adjusted at intervals, on account of term contracts, or owing to custom and convenience. But, since expectations operate mainly by influencing prices, it can be said that rigid prices are the principal medium of transmission through time of inflationary impulses. [...] Intermittently adjustable prices are like springs pressed down over a certain period by progressively heavier weights that are then suddenly lifted. These prices accumulate inflationary pressures for a time and release them later. The principal prices that behave in this manner are public utility rates, food prices when subject to government control, the exchange rate [...], and wages. (Pazos, 1977, p. 50)

From the perspective developed by this author – who makes important analytical contributions to later models in inertial inflation theory – the adjustments of certain prices that are decisive to the inflationary process (such as the nominal exchange rate, public service tariffs, government-administered prices, and nominal wages) constitute periodic impulses to inflation and are responsible for sustaining the nominal exchange rate-price-wage spiral. Since these price adjustments act as periodic inflationary impulses, it is implicit that the frequencies of such impulses are key elements in understanding the inflation level and its fluctuations.

In this literature, despite the development of concepts and analytical contributions that allow for connections between adjustment frequencies, the inflation rate, and conflicting claims over distribution, there is, for the most part, little further exploration of these themes. The exception is Pazos (1972), who develops arguments and concepts that characterize what we consider, in this dissertation, to be the group of inertialist models – as also highlighted by Vera (2013, pp. 264–266). The crucial element in understanding the relationship between the frequency of nominal wage, exchange rate, and administered price adjustments is the recognition that the persistent increase in prices under inflationary conditions gradually erodes real remunerations – as long as nominal variables remain constant over given intervals. All real remunerations associated with periodically adjusted prices follow the trajectory described by the "Simonsen–Pazos mechanism" graph and thus display a maximum, a minimum, and an average level within each interval.

By recognizing such trajectories of real remunerations, the author argues that there is a positive relationship between inflation acceleration and adjustment frequencies because: (i) on one hand, inflation more rapidly erodes real remuneration, reducing the time interval required for real remuneration to fall from its maximum to the minimum compatible with the average obtained; (ii) on the other hand, more frequent adjustments of such prices imply a greater number of impulses in the dynamics of the nominal exchange rate-price-wage spiral. As a result of the described dynamics, it becomes evident that the inflation rate and the adjustment frequency of such prices are positively correlated.

It is worth noting, however, that despite the recognition of distinct trajectories between the real exchange rate (e_r) and the nominal exchange rate (e) – due to the influence of $\hat{e}$ on $\hat{P}$ - this literature does not develop a deeper analysis of the relationships between the real exchange rate, real wages, real mark-up, and distributive incompatibility. The works that explore these distributive topics in greater depth, even not explicitly, are Olivera (1967) and Canavese (1982), who formalize price and nominal wage adjustments as functions of parameters that capture the degree of flexibility of real remunerations (real mark-up and real wage). These parameters implicitly carry a set of relevant concepts related to the functional income distribution, distributive antagonism between real wages and real mark-up, distributive incompatibility, and so on. However, these topics are not explored in detail in that literature.

From the logical sequence discussed, it follows that depreciations of the nominal exchange rate lead to generalized increases in prices and wages, because: (i) a depreciation of the nominal exchange rate ($\uparrow e$) increases the prices of tradable goods in domestic currency ($\uparrow P^T$); (ii) the increase in tradable prices raises the costs of non-tradable goods and nominal wages, as firms and workers adjust prices and wages in an attempt to offset losses in real remuneration. The capacity to reverse the real losses generated by ($\uparrow P^T$) depends on the intensity of the responses in ($\uparrow P^N$) and ($\uparrow W$) following ($\uparrow e$). Regarding this aspect, it is necessary to think in terms of relative prices.

As previously discussed, the depreciation of the nominal exchange rate ($\uparrow e$) is, initially, also a depreciation of the real exchange rate ($\uparrow e_r$). It should be noted that a real exchange rate depreciation represents a change in relative prices, where tradable prices rise in terms of non-tradables ($\uparrow P^T/P^N$). In structuralist theory, the inflationary impulse is related to relative price changes; therefore, the impulse generated by exchange rate depreciation concerns the real exchange rate ($\uparrow e_r$), not the nominal one ($\uparrow e$). It is the real exchange rate depreciation that produces losses in real wages and non-tradables' real mark-up, thereby prompting price and wage adjustments as a response by firms and workers to the real loss. However, while generalized price and wage adjustments appreciate the real exchange rate ($\downarrow e_r$) during the interval in which the nominal exchange rate remains constant (after having depreciated), inflation itself generates a new relative price change that tends to reverse, at least partially, the initial distributive effects. The full reversal of the inflationary impulse depends on whether the intensity of price and wage adjustments is such that $\hat{e} = \hat{P}^T = \hat{P}^N = \widehat{W}$. In this hypothetical case, e_r would return to its pre-depreciation level, and the initial relative prices are restored at a higher level of absolute prices.

2.3. THE EXCHANGE RATE IN INERTIALIST MODELS

As in the previous section, understanding the analytical role played by the exchange rate in inertialist inflation models requires a return to some of the fundamental principles of this theory presented in Chapter 1. It is worth noting in advance that most of the logical mechanisms by which the nominal exchange rate affects prices discussed in structuralist models are also present in inertialist models. However, the inertial inflation theory develops other relevant analytical contributions related to the specification of indexation systems for nominal remunerations and to the possibilities for understanding the relationships between exchange rate, inflation, and functional income distribution. Therefore, to discuss the role of exchange rate in this group of models, through a critical review of the literature, we must focus on some of the elements from the analytical core discussed in Chapter 1 that are decisive for the influence of the nominal exchange rate on prices.[108]

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[108] For a brief synthesis and a description of the theoretical context in which the inertialist literature is situated, see Vernengo (2006, pp. 482–485).

First, it is important to highlight that, in this group of models – as in structuralist theory – a separation is assumed to exist between two distinct sectors in terms of price-setting processes: a "Flex-Price" sector and a "Fix-Price" sector.[109] This disaggregation is a basic assumption of this literature, and various examples of studies explicitly formalize this idea.[110] Thus, considering the previously discussed logic of interactions between changes in "Flex-Prices" and "Fix-Prices," all the mechanisms by which the exchange rate influences prices in the structuralist model also apply to inertialist models.

Recalling the disaggregated representation of the general price index from Chapter 1, the overall price index is represented as:

$$P = p_{Fix}^{\sigma_1} p_{Flex}^{\sigma_2} \tag{1.2.17}$$

$$\sigma_1 + \sigma_2 = 1$$

Where σ_1 and σ_2 represent the shares of the total value of the basket of goods that composes the general price index corresponding, respectively, to "Fix-Price" and "Flex-Price" sectors. Equation (1.13), expressed in terms of rate of change, becomes:

$$\hat{P} = \sigma_1 \hat{P}_{Fix} + \sigma_2 \hat{P}_{Flex} \tag{1.2.18}$$

$$\sigma_1 + \sigma_2 = 1$$

In the "Fix-Price" sector, it is assumed that the exchange rate affects costs through imported inputs, such that it becomes possible to represent price formation in this sector as:

$$P_{Fix} = (1+m)[\frac{W}{B} + \frac{P_a}{a} + e.\frac{P_a^*}{a^*}] \tag{2.3.1}$$

Where P_{Fix} is the price in the "Fix-Price" sector; W is the average contracted nominal wage; B is the technical coefficient of output per unit of labor (Q/L); P_a is the average price of non-tradable inputs used in production; a is the technical coefficient of output per unit of non-tradable input used (Q/A_i); e is the nominal exchange rate; P_a^* is the average dollar price of the tradable input used in production; a^* is the technical coefficient of output per unit of tradable input used in production; and m is the fixed desired (and achieved) real mark-up by firms.

By expressing equation (2.3.1) in terms of growth rates, we can describe price inflation in the "Fix-Price" sector as:

[109] As in the structuralist literature, the inertialist literature makes no effort to explain the logic behind such disaggregation. It is taken as a given. Generally, the flexible-price sector is associated with agriculture, while the fixed-price sector is linked to industry.

[110] Some examples of bibliographic references that explicitly state this assumption are: Lara Resende (1979, p. 11); Lopes and Lara Resende (1979, p. 2), who recognize distinct price behaviors for different groups of goods (in this case, "industrial" and "agricultural"); Modiano (1983a, pp. 2–5); Modiano (1984, pp. 3–6); Modiano (1983b, p. 3); Modiano (1979, pp. 3–6); and Pereira and Nakano (1987).

$$\hat{P}_{Fix} = \lambda_0(\widehat{W}) + \lambda_1(\hat{P}_a) + \lambda_2(\hat{e} + \hat{P}_a^*) + \delta(\widehat{m}) \qquad (2.3.2)$$[111]

Where λ_0 represents the share of inflation in $\hat{P}_{Fix}$ generated by increases in nominal wages; λ_1 represents the share of inflation in $\hat{P}_{Fix}$ generated by inflation in domestic inputs; λ_2 represents the share of inflation in $\hat{P}_{Fix}$ generated by the domestic-currency inflation of imported inputs; δ represents the share of inflation in $\hat{P}_{Fix}$ generated by increases in the desired (and realized) real mark-up.

In the "Flex-Price" sector, two separate price-setting processes are identified: on the one hand, the prices of tradable agricultural goods (P_{AT}), and on the other, the prices of non-tradable agricultural goods (P_{AN}).[112] The influence of the nominal exchange rate in this sector operates through the tradables, because in this case prices are determined such that: $P^T \overset{\leftarrow}{\equiv} e.P^{T*}$.In contrast, the prices of non-tradable agricultural goods are considered exogenous (or determined by an interaction between supply and demand).[113] Following the formal approach proposed by Modiano (1984):

$$P_{Flex} = P_{AT}^{\gamma_1} P_{AN}^{\gamma_2} \qquad (2.3.3)$$

$$\gamma_1 + \gamma_2 = 1$$

In dynamic terms, the variation in prices of "Flex-Price" sector is described as:

$$\hat{P}_{Flex} = \gamma_1 \hat{P}_{AT} + \gamma_2 \hat{P}_{AN} \qquad (2.3.4)$$

The prices of tradable agricultural goods are determined by:

$$P_{AT} \overset{\leftarrow}{\equiv} e.P_{AT}^* \qquad (2.3.5)$$

Rewriting (2.3.5) using growth rates yields:

$$\hat{P}_{AT} = \hat{e} + \hat{P}_{AT}^* \qquad (2.3.6)$$

Substituting (2.3.6) into (2.3.4) gives:

$$\hat{P}_{Flex} = \gamma_1(\hat{e} + \hat{P}_{AT}^*) + \gamma_2 \hat{P}_{AN} \qquad (2.3.7)$$

The prices of non-tradable agricultural goods are considered exogenous, for simplification.

From Chapter 1, it is also useful to recall the specification of nominal wage indexation. As discussed in the closed-economy case, in inertialist models – based on Lopes and Bacha (1983) – the nominal wage variation under the assumed indexation scheme is understood to

[111] In this case, it is assumed, for simplicity, that the technical coefficients "B", "a" and "a^*" remain constant during the considered period.
[112] As formalized by Modiano (1979, 1984).
[113] This formulation, based on the interaction between supply and demand, has theoretical problems, and the empirical results obtained by Modiano (1984) point to the inadequacy of this type of formalization.

follow a dynamic in which average nominal wages are indexed partly to current inflation and partly to past inflation, such that:

$$\widehat{W}_t = h\widehat{P}_t + (1-h)\widehat{P}_{t-1} \qquad (2.3.8)$$

$$h = 1 - \frac{1}{2n}$$

Where n is the frequency of wage adjustments within a given reference period.

Accordingly, the logical sequence is: the depreciation of the nominal exchange rate increases the prices of goods that are set exclusively in international markets, according to equation (2.2.2), which causes a change in relative prices between two distinct groups of goods.[114] Among the goods whose prices have risen due to the depreciation of the nominal exchange rate, some enter as costs in the "Fix-Price" sector, while others enter directly into workers' consumption baskets. As a result, on the one hand, given the specific assumption in this literature that prices in the "Fix-Price" sector are set as a fixed real mark-up over unit direct costs, it is assumed that this sector adjusts its prices immediately, without incurring losses in real mark-up due to rising costs. On the other hand, given the assumptions related to the wage indexation system discussed in Chapter 1, workers experience real wage losses during the period in which nominal wages remain unchanged and then, with a certain lag, adjust nominal wages based on accumulated inflation to recover the peak real wage of the previous period. New rounds of nominal exchange rate depreciation restart the described logical sequence.

Equations (2.3.1) to (2.3.7) present the mechanisms through which changes in the nominal exchange rate influence prices. In this literature, the nominal exchange rate enters the cost structure of the "Fix-Price" sector through imported inputs and influences the price-setting process in the "Flex-Price" sector through tradable agricultural goods.[115] In this regard, a nominal exchange rate depreciation leads to generalized increases in prices. Therefore, the impact of nominal exchange rate depreciation manifests directly or indirectly as increases in the prices of all goods and, consequently, leads to subsequent nominal wage adjustments.

It is worth noting that although the logic of the mechanisms by which the nominal exchange rate influences prices is similar in structuralist and inertialist models, the specific assumptions regarding the indexation of nominal remunerations to inflation generate differences in the distributive outcomes of nominal exchange rate increases, price increases,

[114] For internal coherence in the dissertation, to address the impacts of the nominal exchange rate, we will classify sectors as tradables and non-tradables. However, the literature presents other specifications for these groups of goods, such as imported/domestic and agricultural/industrial.

[115] It is important to emphasize that this type of disaggregation in the price formation process is highly simplified and sometimes poorly specified. To understand this point, it is useful to think in some tradable goods whose prices are set entirely in the international market, are not agricultural.

and wage adjustments. The fundamental analytical element for distributive "closure" in this group of models lies in the idea that the equilibrium in functional income distribution is determined *a priori* by the ability of firms to set the real mark-up (and effective real wage) they desire.[116] In this regard, a core theoretical feature of inertialist models is that the real mark-up remains unchanged throughout the inflationary process, regardless of the inflation level – even in the hypothetical case of frequent and sharp exchange rate depreciations. By contrast, the real wage, on average between wage adjustments, is inversely related to the inflation rate.

Still regarding the assumptions related to functional income distribution, it is important to note that in a closed economy, based on the analytical simplifications discussed, the literature assumes an inverse relationship between the real wage and the real mark-up.[117] However, the introduction of the external sector in the price formation process adds new distributive relationships. To address these, it is useful to consider the impacts of exchange rate variations on the shares of the external sector and of wages in production costs – which requires an understanding of the relationships between the nominal exchange rate, the real exchange rate, and the real wage.

First, note that a depreciation of the nominal exchange rate or an increase in international prices in dollars increases costs in the "Fix-Price" sector, and this increase in costs (corresponding to the inputs whose prices have risen) is immediately passed through to prices. However, during the period in which nominal wages remain unchanged, price increases result in a reduction in real wages. Assuming the nominal exchange rate adjusts periodically (remaining constant for a period after depreciating), it is only when all nominal wages grow at the same rate of the nominal exchange rate that the distributive impact of nominal (and real) exchange rate depreciation can be reversed by domestic inflation.

Given the assumption that prices are set as a fixed real mark-up over unit direct costs, these models establish an inverse relationship between the real wage and the real exchange rate. This inverse relationship is explained by the fact that the relative price change caused by the nominal exchange rate depreciation does not reduce the mark-ups of firms producing non-tradable goods, since nominal mark-ups are assumed to be perfectly indexed to current inflation. If the average nominal wage does not rise enough to restore the peak real wage of the pre-depreciation period, the inflation rate required to realize the desired real mark-up is lower than

[116] As discussed in the previous chapter, this form of *a priori* determination of the functional income distribution implicitly assumes that the nominal mark-up is perfectly indexed to inflation, while the nominal wage is imperfectly indexed.

[117] In a closed economy, the argument for such an inverse relationship is straightforward, since total income is necessarily divided between wages and profits, so that for one share to increase, the other must decrease.

the rate of nominal exchange rate depreciation ($\hat{e}$), since one of the cost components (the wage bill) decreases its relative share in gross output. In this regard, some authors explicitly state the inverse relationship between the real exchange rate and the real wage.[118] Lara Resende (1979, p. 10) associates real exchange rate depreciation with the increase in "external sector claims on national income",[119] and Modiano (1984, p. 9) makes the logic explicit:

> A real exchange rate depreciation ($\hat{\omega} = \hat{w} - \hat{p}$) reduces the growth rate of real wages. This occurs because depreciation raises industrial prices due to increased costs and agricultural prices through higher prices for exportable goods. Since the corresponding increase in the aggregate price index is only partially passed on to nominal wages in the current period, the real wage decreases. (Modiano, 1984, p. 9)[120]

Thus, given the imperfect – that is, lagged – indexation of nominal wages to current inflation, as discussed in Chapter 1, nominal exchange rate depreciations lead to (smaller) real exchange rate depreciations, and it is the real exchange rate depreciation that results in lower real wages.

Note that if real wages were assumed to be perfectly indexed to current inflation – as nominal mark-ups are – then any increase in the nominal exchange rate would trigger identical increases in prices and wages, making any change in the real exchange rate impossible. Under this condition of full indexation of all nominal remunerations, inflation would be incapable of causing any change in relative prices, whether through real exchange rate depreciation, real wage reduction, or real mark-up reduction.

Considering the topics discussed, it is still necessary to examine some specific assumptions in this literature regarding the trajectory of the nominal exchange rate under inflationary conditions. In general, this literature assumes the existence of a crawling-peg regime,[121] such that the nominal exchange rate adjusts to ensure that the real exchange rate reaches a target value at periodic intervals, always compensating for the difference between internal and external inflation (in domestic currency).[122] However, the depreciations of "e" occur at well-defined intervals, so that e_r fluctuates between the nominal exchange rate adjustments, during the intervals "e" remains fixed. In this case, since in crawling-peg regimes a certain target level of e_r is restored with each adjustment of "e", we can describe the logic of nominal exchange rate adjustments in terms of a constant rate of change in e_r, as:

[118] The perception of the inverse relationship between the real exchange rate and the real wage is highlighted in Lara Resende (1979, p. 10), Modiano (1984, p. 9), and Modiano (1985a, p. 14). Arida and Lara Resende (1984, pp. 7-8) argue that the mechanism of relative price adjustment generated by the depreciation of the real exchange rate occurs through the reduction of real wages accompanied by an acceleration of inflation.
[119] Own translation.
[120] Own translation.
[121] Gandolfo (2016, p. 42).
[122] For an example of this type of treatment of the nominal exchange rate, see Modiano (1988, pp. 34-54).

$$\hat{e}_r = \hat{e} + \hat{P}^* - \hat{P} = 0 \tag{2.3.9}$$

Thus, to ensure the validity of the equation above:

$$\hat{e} = \hat{P} - \hat{P}^* \tag{2.3.10}$$

Since depreciations do not occur continuously over time, but rather at well-defined intervals, it becomes necessary to describe exchange rate adjustments in terms of accumulated inflation over the previous period:

$$\hat{e}_t = \hat{P}_{t-1} - \hat{P}^*_{t-1} \tag{2.3.11}$$

To include the possibility of "real exchange rate shocks" – which represent discretionary changes in e_r that may be pursued by economic policy – we can rewrite the nominal exchange rate adjustment rule as:

$$\hat{e}_t = \hat{Z}_{er} + \hat{P}_{t-1} - \hat{P}^*_{t-1} \tag{2.3.12}$$

Here, $\hat{Z}_{er}$ captures a shock component associated with a change in the real exchange rate.[123]

A relevant consequence of this dynamic of exchange rate depreciations is that, by making the variation of "*e*" indexed to past inflation, an inertial component is added to the inflationary process (like nominal wages), establishing a system of periodic impulses to inflation with each new round of "*e*" depreciation.[124] Given that $\hat{e}_t = \hat{P}_{t-1}$ – assuming there is no intention to change e_r and that external inflation is zero in the period under consideration, for simplification – each round of nominal exchange rate adjustment generates an inflationary impulse equal to the accumulated inflation in the previous period, thus transmitting past inflation as a future inflationary impulse.

As discussed in Chapter 1, in inertial inflation models, the inflation rate reaches an equilibrium in which $\hat{P} = \hat{W} = \hat{P}_{-1} = \hat{W}_{-1}$. It should be noted that, with the inclusion of the nominal exchange rate depreciation policy described here, the indexation of "*e*" to past inflation implies that, in equilibrium, $\hat{P} = \hat{W} = \hat{P}_{t-1} = \hat{W}_{t-1} = \hat{e} = \hat{e}_{t-1}$. In this case, both the real wage and the real exchange rate stabilize at the average over successive periods. However, given the inverse relationship between real wages and the real exchange rate, any exchange rate shock that increases e_r (either through a nominal depreciation higher than past inflation or through shocks in international prices) introduces stronger inflationary impulses for future periods. Following such a shock, the indexation rule for "*e*" perpetuates the stronger impulses

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[123] This specification of the dynamics of nominal exchange rate adjustments is also found in Modiano (1984, p. 6).

[124] Equation (2.3.12) formalizes the dynamics of the 'intermittent adjustments' of the exchange rate discussed by Pazos (1977, p. 50).

associated with the earlier shock, keeping e_r permanently more depreciated, accelerating inflation, and reducing the real wage on average across intervals – given the frequency of wage adjustments.

Finally, it is worth highlighting that as inflation accelerates, the erosion of real incomes intensifies during the intervals in which nominal variables remain unchanged. Thus, a long-run positive and inevitable relationship arises between higher inflation and a higher degree of nominal indexation (i.e., increases in the frequency of adjustments, which imply shorter intervals in which nominal remunerations remain constant). On this point, Arida and Lara Resende (1984) clearly argue: "the losses caused by large accelerations of inflation render the legal recasting of contracts inevitable. The higher the on-going rate of inflation, the smaller the normal indexation period tends to be" (Arida; Lara Resende, 1984, p. 7). However, as previously discussed, increases in the frequency of price, wage, and exchange rate adjustments also contribute to rising inflation, given the gap between the maximum and average real wages in each period. In this sense, adverse shocks to real remunerations (such as a depreciation of e_r obtained through a higher growth rate of "e") raise the inflation rate through two mechanisms: (i) directly increasing the prices of a group of goods and changing relative prices, with the distributive and inflationary consequences already discussed; and (ii) increasing the frequency of adjustments in prices, wages, and the nominal exchange rate.

It is interesting to observe that in inertialist literature, by assuming that nominal exchange rate adjustments are indexed to the accumulated inflation of the previous period, if the goal of economic policy is to maintain e_r at a certain average level, some additional mechanisms emerge, establishing a positive correlation between the frequency of nominal exchange rate adjustments on the one hand, and the frequency of wage adjustments on the other. As noted in Chapter 1, given the gap between b_{max} and $\bar{b}$, inflation adjusts endogenously to ensure that the effective $\bar{b}$ matches the mark-up target of firms. In this context, the higher the frequency of wage adjustments (i.e., the shorter the interval during which nominal wages remain fixed), the higher the inflation rate – and consequently, the greater the frequency of nominal exchange rate adjustments needed to maintain a given real exchange rate target on average across periods. Therefore, there is a positive relationship between the frequency of wage adjustments and the frequency of nominal exchange rate adjustments.

2.4. THE EXCHANGE RATE IN CONFLICTING CLAIMS MODELS

This section examines the analytical role of the exchange rate in Conflicting Claims models, returning to some foundational elements of the theory presented in Chapter 1. Unlike previous models, the Conflicting Claims models do not center their analysis on the disaggregation of the economy into two sectors with distinct price-setting processes. As a result, they give limited emphasis to how the exchange rate affects relative price ($\frac{P^T}{P^N}$), leading to key analytical differences from the structuralist and inertialist approaches.

To understand how the exchange rate (both nominal and real) influences prices and the functional income distribution from the perspective of inflation driven by conflicting claims over distribution, we begin by revisiting the analytical role of the external sector in Rowthorn's aspiration gap framework, as developed by Rowthorn (1977, pp. 216–218) and reaffirmed in Rowthorn (2024, pp. 2–3). This approach uses a stylized representation of the economy to explain conflicting claims through the interaction of four income-appropriators groups: (1) the state, which absorbs its income share through taxation; (2) the external sector, which absorbs its income share through import costs; (3) private-sector workers, which absorb its income share through post-tax wages; and (4) domestic capitalists, which absorb its income share through post-tax profits. To represent each group's share in total income, we define: T is the share appropriated through taxation; F is the share appropriated through import costs; ω^E is the wage share; π^E is the profit share. These components satisfy the identity:

$$1 = T + F + \omega^E + \pi^E \qquad (2.4.1)$$

If we treat T and F as exogenously determined, only 1 – T – F remains for wages and profits. If workers and capitalists pursue income shares that together exceed this residual, inflation arises as both groups respond to the resulting incompatibility. In this setting, any gain by one group necessarily reduces the other's share, since wage and profit shares move inversely. To formalize this, define : ω^W is the target wage share (assumed to be $\omega^W \geq \omega^E$); π^F is the target profit share (assumed to be $\pi^F \geq \pi^E$). When these targets are incompatible with each other and with the available income, Rowthorn (1977, 2024) defines the aspiration gap as:

$$Aspiration\ Gap = \omega^W + \pi^F + T + F - 1 \qquad (2.4.2)$$

Under the assumption that T and F are exogenous, any excess $\omega^W + \pi^F$ over 1 – T – F reflects the existence of conflicting claims over distribution. Exogenous increases in T or F intensify this conflict, reducing the residual income available to workers and capitalists and widening the gap between actual and target shares – that is, increasing $(\omega^W - \omega^E)$ and $(\pi^F -$

π^E).[125] This logic is essential to understand the role the external sector and exchange rates play in inflationary dynamics.

Post-Keynesian conflicting claims models incorporate this aspiration gap framework into the price-setting process by assuming that firms apply mark-up over unit direct costs. In open economies, the exchange rate affects prices by influencing the cost of imported inputs. These models do not distinguish between the effects of exchange rate changes on different price groups. Instead, they express the general price-setting process as:

$$P = (1 + m).u \qquad (2.4.3)$$[126]

where m is the real mark-up[127] and u is the unit direct cost.

Unit direct cost includes both labor costs per unit of output and imported material costs. To incorporate the external sector, this literature typically includes only imported inputs in material costs (excluding domestic ones), leading to:

$$P = (1 + m).(W\alpha + eP_f\theta) \qquad (2.4.4)$$[128]

where: P is the domestic price level; W is the nominal wage; α is the labor-output ratio (L/Q); θ is the imported input-output ratio ($\frac{A_i^*}{Q}$); e is the nominal exchange rate; P_f is the price of imported inputs in foreign currency.

By excluding domestic inputs, the model simplifies the analytical role of the external sector as a component of cost and avoids complications arising from changes in relative prices.[129] Equation (2.4.4) separates prices into three distinct income-appropriating components: (i) workers, through the wage bill ($W\alpha$), (ii) the external sector, through imported input costs ($eP_f\theta$), (iii) capitalists, through the mark-up over total direct costs ($m.(W\alpha + eP_f\theta)$).

This clear separation into distinct income-appropriating groups enables a precise examination of the relationships between price formation and income distribution. Following Bastian and Setterfield (2020, pp. 1278–1279), we can algebraically manipulate equation (2.4.4) to further analyze these relationships. In doing so:

$$(1 + m)W\alpha = P - (1 + m)eP_f\theta$$

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[125] In other words, increases in the share of T or F generate increases in the Aspiration Gap.

[126] This is a theoretical starting point widely accepted in the literature, as can be seen in Lavoie (2022, p. 594); Hein (2023, p. 76); Campaña (2024, p. 5).

[127] Which means that the mzrk-up applied over the replacement cost is considered.

[128] This way of introducing the external sector into the price equation can be observed in Hein and Vogel (2007, p. 4); Lavoie (2022, p. 583); Bastian and Setterfield (2020, p. 1278).

[129] However, this simplified representation omits a relevant component of the direct unit costs (domestic inputs), and thus becomes less representative of reality.

Dividing both sides by P, we obtain:

$$(1+m)\left(\frac{W}{P}.\alpha\right) = 1-(1+m)e_r\theta \tag{2.4.5}$$

To understand distributive relations through price determination, it suffices isolate the real wage ($\frac{W}{P}$) and the real mark-up (m) from equation (2.4.5). Starting with the real wage, we obtain:

$$\frac{W}{P} = \frac{1-(1+m)e_r\theta}{(1+m)\alpha} \tag{2.4.6}$$

Equation (2.4.6) makes it clear that the real wage is a decreasing function of the real mark-up, the real exchange rate, and the imported input coefficient in production (measured as units of imported inputs per unit of output). Conversely, the real wage increases with the technical coefficient of output per unit of labor.

To clarify the inverse relationship between the real wage and the real exchange rate, we take the partial derivative of the former with respect to the latter:

$$\frac{\partial\frac{W}{P}}{\partial e_r} = -\frac{\theta}{\alpha} < 0 \qquad (2.4.7)^{130}$$

Just as we isolated the real wage from equation (2.4.5) to specify its determinants, we can isolate the mark-up to understand how this variable fits into income distribution. Through algebraic manipulation of equation (2.4.5), we obtain:

$$m = \frac{1-(\frac{W}{P}\alpha+e_r\theta)}{\frac{W}{P}\alpha+e_r\theta} \tag{2.4.8}$$

Equation (2.4.8) shows that the mark-up is a decreasing function of the real wage, the real exchange rate, and the imported input coefficient in the production process. Conversely, it is an increasing function of the output-labor technical coefficient.

The partial derivative of the mark-up with respect to the real exchange rate is:

$$\frac{\partial m}{\partial e_r} = \frac{-\theta}{(W\alpha+e_r\beta)^2} < 0 \qquad (2.4.9)^{131}$$

The inverse relationships that the real exchange rate maintains with both the real wage and the real mark-up – demonstrated by partial derivatives (2.4.7) and (2.4.9), respectively – carry significant implications within the framework of aspiration gap developed by Rowthorn (1977, 2024). The partial derivatives clearly shows that real exchange rate depreciation necessarily reduces the income share of wages and/or profits, as it represents an increase in the share claimed by the external sector. Therefore, as previously discussed, when the external

[130] This procedure is realized in Bastian and Setterfield (2020, pp. 1278-1279).
[131] This procedure is also realized in Bastian and Setterfield (2020, pp. 1278-1279).

sector captures a larger portion of gross private income through real exchange rate depreciation, the conflicting claims over distribution between real wages and real mark-ups become more intense, given their inverse relationship. Since real exchange rate depreciation intensifies the conflicting claims (while appreciation mitigates it) – as demonstrated through the basic algebra of the pricing equations under the model's assumptions – we can now assess how the real exchange rate influences the price and wage adjustment equations under the dynamic described by the conflicting claims equations. As discussed in Chapter 1, in closed economies, the formalization of price and wage adjustments, without indexation to past inflation, is:

$$\hat{P} = \beta^k(b - b^k) \tag{2.4.10}$$

$$\widehat{W} = \beta^w(b^w - b) \tag{2.4.11}$$

Based on these two functions, which describe how bargaining power and the gap between actual and target real wages drive price and nominal wage adjustments, we aim now investigate how the exchange rate enters the model. The standard formalization adopted in the Post-Keynesian literature to incorporate the external sector – through the real exchange rate – into the conflicting claims equations is found in Blecker (2011) and Lavoie (2014).[132] Given the inverse relationship between the real exchange rate and the sum of wage and profit shares in income, Blecker (2011) assumes that increases in e_r lead to reductions in firms' target real wages (b^k). According to this author, the target mark-up increases with e_r.[133] Blecker (2011, pp. 11–12) formalizes this idea by specifying the target real wage of firms as an inverse function of the real exchange rate:

$$b^k = b_0^k - b_k^{er} e_r \tag{2.4.12}$$

Where b_0^k is a parameter that varies inversely with the firms' domestic market power, and b_k^{er} is a positive parameter. Thus, the price adjustment function in the open economy context becomes:

$$\hat{P} = \beta^k(b - b_0^k + b_k^{er} e_r) \tag{2.4.13}$$

In contrast, the model assumes that changes in the real exchange rate do not affect workers' real wage targets (b^w). However, an increase in e_r leads to a higher nominal wage adjustment due to an additional component, because:

[132] It is possible to find alternatives to the standard model proposed, for example, by Bastian and Setterfield (2020, p. 1280), and Campaña (2024, pp. 10-11). The alternative proposed by Bastian and Setterfield (2020) was accepted and incorporated in Lavoie (2022, p. 622).

[133] The author justifies this assumption through an association between increases in the prices of imported goods competing with domestic goods and an increase in the market power of domestic firms. From our perspective, as will be argued later, the capitalists' real wage target follows an inverse function with the real exchange rate, as Blecker (2011) does, but for different reasons. We reject the notion that real exchange rate depreciation increases the mark-up target.

> the cost of imported workers' goods rises, and while we don't model this effect explicitly we can incorporate it by assuming that workers demand higher nominal wage increases in response. (Blecker, 2011, p. 224).

As a result, the nominal wage adjustment equation becomes:

$$\widehat{W} = \beta^{w}(b^{w} - b) + \gamma e_r \qquad (2.4.14)$$

According to the author, the parameter γ increases with both the share of imports in workers' consumption basket and the degree of unionization. As shown in equations (2.4.13) and (2.4.14), introducing the real exchange rate into the wage and price adjustment equations makes each adjustment a rising function of the real exchange rate. Therefore, real exchange rate depreciation raises the inflation rate as a result of heightened conflicting claims over distribution.

Regarding the way the real exchange rate is formalized in the conflicting claims equations, Bastian and Setterfield (2020, pp. 1279–1280) and Lavoie (2022, p. 622) propose a modification to Blecker's (2011) approach: not only does the capitalists' real wage target become an inverse function of the real exchange rate, but the workers' real wage target also adjusts – becoming a positive function of e_r. Hence, in the modified version proposed by Bastian and Setterfield (2020) and incorporated by Lavoie (2022), the workers' real wage target becomes a positive function of the real exchange rate, such that:

$$b^{W} = b_0^{W} + b_w^{er} e_r \qquad (2.4.15)$$

Accordingly, the nominal wage adjustment equation also changes:

$$\widehat{W} = \beta^{w}(b_0^{W} + b_w^{er} e_r - b) \qquad (2.4.16)$$

In this modified version of the wage adjustment function (2.4.16), as in the previous version (2.4.14), an increase in e_r intensifies conflicting claims and raises the inflation rate. However, the assumption that workers increase their real wage targets in response to higher e_r is hard to justify. The more plausible argument, as in Blecker (2011), is that nominal wage increases become necessary simply to recover the pre-depreciation real wage target, which had been determined by other factors unrelated to the exchange rate.

2.4.1. Analytical Contributions and Issues in the Formalization of the Real Exchange Rate in the Model

Based on the presented model, we can discuss some of its theoretical and analytical contributions, as well as certain problems related to the formalization of the real exchange rate.

Among the contributions of conflicting claims models, one finds the analytical clarity generated by the direct association between changes in the real exchange rate and changes in the external sector's share of the private sector's gross income. This is a relevant aspect of the theory, as it allows these models to represent the distributive effects of the real exchange rate through the inverse relationship between (i) the real exchange rate and the real wage, and (ii) the real exchange rate and the real mark-up. Since inflation in these models is formalized as a direct expression of conflicting claims over distribution, the clarity surrounding the connection between real exchange rate depreciation and intensification of the conflicting claims makes it possible – and analytically simple – to incorporate the effects of the real exchange rate into the inflationary process. However, the formalization of the real exchange rate in the nominal wage and price adjustment functions poses certain issues that deserve attention.

From our perspective, the ways in which the real exchange rate is represented in these models – as described by the assumptions underlying equations (2.4.12) through (2.4.16) – suffer from the same issues raised in Chapter 1 regarding price and wage adjustment equations that include indexation components. These equations introduce additional components related to e_r as if they could be analytically separated from the effects of the exchange rate on $(b^w - b)$ and $(b - b^k)$. In reality, however, the effective real wage itself is a function of e_r, meaning that its effects should be formalized solely through increases of $(b^w - b)$ and $(b - b^k)$. Furthermore, despite rejecting Blecker's assumption that firms increase their desired mark-up, we consider it logically sound to assume that firms reduce their desired real wage target (b^K), since a real exchange rate depreciation – by reducing the residual share of gross income to be distributed between wages and profits – requires a decrease in real wages to preserve the desired real mark-up.

Given that real exchange rate depreciation follows the identity $\hat{e}_r = \hat{e} + \hat{P}^* - \hat{P}$, this literature acknowledges that nominal exchange rate depreciation and rising international prices in dollars contribute to intensifying the conflicting claims over distribution and to increasing inflation. However, unlike inertialist inflation theory, this literature does not explore in depth the dynamics of nominal exchange rate adjustments $\hat{e}$, nor the relationship between $\hat{e}$ and $\hat{e}_r$, nor does it address the frequency of nominal exchange rate adjustments. As a result of this omission, the literature also fails to examine whether the real exchange rate can resist depreciations in an inflationary context in which rising domestic inflation tends to appreciate the real exchange rate between nominal exchange rate adjustments. Generally, the literature treats the real exchange rate as an exogenous variable, limiting the analysis to the distributive and inflationary impacts of variations in e_r.

2.5. LESSONS FOR THE REPRESENTATION OF THE EXCHANGE RATE IN COST-PUSH INFLATION MODELS

Based on the analytical contributions advanced by the three groups of inflation models discussed in this chapter, we believe it is possible to draw some theoretical and formal lessons for developing a coherent framework to analyze the impacts of the exchange rate on inflation dynamics. Drawing on Serrano, Summa, and Morlin (2024) as a reference for describing nominal wage and price adjustments, inflation should be formalized as the result of two components: (i) the distributive incompatibility between workers' and firms' real wage targets, and (ii) the frequency of adjustments.[134] Given the analytical contributions discussed in the previous sections, it is necessary to acknowledge that, in an open economy, variations in the exchange rate (both nominal and real) significantly influence both distributive incompatibility and the frequency of nominal price and wage adjustments.

This chapter discussed some central contributions that deserve special emphasis: (i) nominal exchange rate depreciations generate inflationary impulses; (ii) real exchange rate depreciations constitute changes relative prices between tradables and non-tradables, and such changes reduce the real wage and the real mark-up (in the non-tradable sector), thereby intensifying the distributive incompatibility; (iii) the real exchange rate follows a oscillatory path between nominal exchange rate adjustments, reaching a maximum immediately after a depreciation and a minimum immediately before the next; (iv) inflation accelerates in parallel with increasing adjustment frequencies of nominal exchange rates, prices, and wages.

From structuralist models, the following aspects are relevant for assessing the analytical role of the exchange rate in cost-push inflation models: (i) the association between tradable goods and the "Flex-Price" sector on one hand, and non-tradables and the "Fix-Price" sector on

[134] Serrano, Summa, and Morlin (2024) reinterpret the bargaining power parameters of the Conflicting Claims models and replace them with frequencies of price and wage adjustments. Consequently, they describe the inflationary process through functions of the differences between the effective real wage and real wage targets, and the frequencies of adjustments. In their proposed reinterpretation of the model, the authors demonstrate the inevitable relationship between the notion of the degree of indexation (which relates to the degree of resistance of real wages) and the frequencies of adjustments, where the higher the frequency of adjustments, the greater the degree of indexation — and the assumption of perfect indexation of a nominal variable is equivalent to assuming an infinite frequency of adjustments. The reinterpretation of the model developed in this work integrates theoretical and analytical aspects of the Conflicting Claims models with other contributions developed by the CEPG models and the theory of inertial inflation.

the other; (ii) the description of how nominal (and real) exchange rate depreciation initially leads to changes in relative prices – i.e., an increase in $(\frac{P^T}{P^N})$; (iii) the recognition of sectoral interdependence and, consequently, the interdependence of all prices; (iv) the connection between relative price changes (driven by real exchange rate variation) and distributive effects – explained by higher prices of consumption goods for workers and increased production costs; (v) the account of how nominal exchange rate depreciation – by altering relative prices – triggers price and wage adjustment dynamics, driven by conflicting claims over distribution.

From inertialist models, in addition to the full logical sequence of inflation propagation caused by nominal depreciation as developed by structuralist theory, the following are relevant contributions for assessing the analytical role of the exchange rate: (i) the formalization and discussion of the meanings of indexation of nominal variables to inflation; (ii) the dissociation between the trajectories of the nominal and real exchange rates; (iii) the description of the dynamics of nominal exchange rate adjustments in an inflationary context, with indexation of the nominal exchange rate variation to past inflation; (iv) the recognition of the inverse relationship between the real wage and the real exchange rate; (v) the association between real exchange rate depreciation, rising inflation, and declining real wages.

From conflicting claims models, the following stand out as relevant contributions to the evaluation of the analytical role of the exchange rate in cost-push inflation models: (i) the assertion of conflicting claims between the external sector, wages, and profits in terms of their shares of the gross income of the private sector; (ii) the clarification of the distributive impacts associated with variations in the real exchange rate, involving reductions in both the real wage and the real mark-up; (iii) the determination of the possible distributive outcomes of inflation between the real wage targets of workers and firms.

CHAPTER 3. RELATIVE PRICES, INERTIA, AND CONFLICTING CLAIMS IN AN OPEN ECONOMY: THE NOMINAL EXCHANGE RATE–PRICE–WAGE SPIRAL

3.1. INTRODUCTION

Building on the set of analytical contributions presented thus far, this chapter investigates the mechanisms through which increases in the frequency of nominal exchange rate depreciations lead to increases in the frequency of nominal price and wage adjustments, forming a nominal exchange rate-price-wage spiral. In addition to the foundations provided by the models discussed in Chapter 2, our analysis also draws on extensions of the classical system of relative prices to open economies, as developed in recent works – particularly those by Steedman (2001); Machado (2017, 2022); Morlin (2023); Dvoskin, Feldman, Montes-Rojas (2024); Dvoskin, Feldman, Garegnani (2024); and Alvarez (2024).[135]

To achieve the chapter's objective, we must follow a logical path in the presentation of arguments. For this purpose, three key steps are necessary: (i) introducing the nominal exchange rate "*e*" as an exogenous variable that changes relative prices;[136] (ii) discussing how changes in relative prices caused by increases in "*e*" affect distributive incompatibility; and (iii) examining the mechanism through which the frequency of nominal exchange rate adjustments influences the frequencies of price and wage adjustments. The sections of this chapter are organized according to these steps.

3.2. EXCHANGE RATE AND RELATIVE PRICES

To analyze the role of the nominal exchange rate in the system of relative price, we draw on key contributions obtained from the works of Machado (2017, 2022), Steedman (2001), Morlin (2023), and especially Dvoskin, Feldman, Montes-Rojas (2024) to explore economies that import goods and produce tradable goods in markets in which they act as price takers. The underlying logic is similar to that found in structuralist and inertialist models. However, the formalization of price interdependence developed in the literature grounded in Sraffa (1960) allows for a deeper exploration of key mechanisms and concepts that help explain the possible impacts of nominal exchange rate changes.

[135] Discussions of Argentina's inflation trajectory aligned with the theoretical perspective advanced in this literature are presented in Fiorito and Vernengo (2022), and Alvarez and Médici (2024).
[136] Which establishes the equilibrium around which all the various market prices gravitate.

Given that the prices of tradable goods (price-takers) are determined exogenously – outside the analytical scope of domestic production processes –, nominal exchange rate depreciation causes the prices of these goods in domestic currency to rise relative to nominal wages and to the prices of non-tradable goods at the time the depreciation occurs. This, in turn, increases the mark-up in the sectors producing tradable goods.[137] If imports and tradables are basic goods[138] (which is commonly the case in practice), a variation in "*e*" simultaneously impacts input costs across all production processes and raises the cost of workers' consumption baskets. Therefore, in the case of a nominal exchange rate depreciation, if the domestic currency price increase of tradable basic goods is not matched by equivalent pass-through to the prices of all non-tradables and by nominal wage increases, there will be an initial general decline in real mark-ups across non-tradable sectors[139] and a reduction in real wages.[140]

In this context, the absence of subsequent inflationary adjustments (through wage and price increases) following a depreciation of "*e*" would necessarily entail significant distributive effects in economies that are price takers for a set of basic tradable goods: (i) an increase in the profit rate in the tradable price takers sectors; (ii) a decline in the profit rate in all other sectors; and (iii) a reduction in real wages.

These short-run distributive impacts (abstracting from the subsequent inflation dynamics) of a depreciation in "*e*" can also be illustrated using a simplified model. Instead of employing the full system developed by Sraffa (1960) – often represented and expanded through linear algebra, as done by Pasinetti (1977); Kurz and Salvadori (1995); Bhering (2016, *mimeo*);

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[137] It should be noted that nominal wages are set in the domestic currency and do not adjust instantaneously to compensate for changes in the nominal exchange rate. Therefore, when increases in 'e' occur, changes arise in the nominal wages expressed in dollars of a national economy – and this, by itself, ensures the increase of the profit rate in the tradable price taker sectors mentioned. A more detailed discussion of this logic is presented in Machado (2017).

[138] In the sense established by Sraffa (1960), discussed by Pasinetti (1977) and Roncaglia (2009). As stated in Roncaglia (2009, pp. 65-66), citing Sraffa (1960, p. 8): 'The criterion [for distinguishing basics from non-basics] is whether a commodity enters (no matter whether directly or indirectly) into the production of all commodities.' Similarly, Pasinetti (1977, pp. 104-105) describes basic commodities as those required for the production of all commodities (both basic and non-basic); on the other hand, he describes non-basic commodities as those not required for the production of basic commodities (although they may be required for the production of non-basic ones).

[139] For simplicity, we can treat all tradables as price takers.

[140] Burstein, Eichenbaum, and Rebelo (2003) find empirical evidence indicating that large nominal exchange rate depreciations generate, in the short run, different price changes between tradables and non-tradables. According to the authors, the pass-through of nominal exchange rate depreciations to tradable goods prices is much greater than to non-tradable goods prices. Dvoskin, Feldman, and Montes-Rojas (2024) find empirical evidence that depreciations of "*e*" create short run differences in profitability between sectors (increasing profitability of tradables while having no significant impact on non-tradables). These findings support the argument that the initial effect of exchange rate depreciation is an alteration of the relative price vector with significant distributive repercussions in the short run.

Roncaglia (1978); Petri (2021), among others – we use a simplified model to maintain a similar level of formal complexity as the other models discussed in the dissertation.

Following the exposition by Dvoskin, Feldman, and Montes-Rojas (2024, pp. 5–7), the aim is to illustrate the effects of "e" on relative prices and distribution through a simplified representation of economic system.

It is important to emphasize that, although we rely on the analytical foundations developed by these authors, we choose to describe prices using real mark-ups rather than profit rates. This specific – but analytically decisive – modification reflects the fact that, unlike the reference models that focused on long-run production prices determination, our analysis targets the immediate and temporary distributive effects (in the short run) resulting from changes in the nominal exchange rate, which manifest through changes in real mark-ups and real wages.

In this model, we assume: (i) only two goods are produced; (ii) both are basic goods; (iii) one is tradable (T) and the other is non-tradable (N); and (iv) an imported good (M) is used as an input in the production processes of both basic goods. Given that the prices of tradables and imported goods are entirely determined abroad, we can state that:

$$P^T \overset{\leftarrow}{\equiv} eP^{T*} \tag{3.2.1}$$

$$P^M \overset{\leftarrow}{\equiv} eP^{M*} \tag{3.2.2}$$

Where P^T and P^M are the prices of goods T and M in domestic currency, and P^{T*} and P^{M*} are the prices of T and M in dollars.

Let: l^T be the number of hours of labor required to produce one unit of the tradable good; l^N be the number of hours of labor required to produce one unit of the non-tradable good; m^T be the real mark-up in the tradable sector; m^N be the real mark-up in the non-tradable sector;[141] W be the uniform hourly wage in this economy.[142]

Since both the tradable (T) and non-tradable (N) goods are basic, and that the imported goods (M) are used in both production processes, then T, N and M are inputs in the production of all other goods (either directly or indirectly). In this case, the prices are:

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[141] In the model, we adopt distinct notations for the mark-ups of tradables and non-tradables to represent the differentiated mark-ups that result from the short-run distributive impacts associated with nominal exchange rate variations. However, in the long run, we assume an adjustment of supply to effective demand which – according to the logic of the competitive process in the classical sense, as discussed by Eatwell (1982), Garegnani (1983, 1990), Ciccone (2011), Serrano (2012), and Vieira (2018) – generates a tendency (that may not materialize due to a set of exogenous variables beyond the scope of this work) toward the equalization of profit rates. This tendency is reflected in the convergence of mark-ups across sectors.

[142] To follow Dvoskin, Feldman, and Montes-Rojas (2024) and to simplify the exposition, we use the assumption of uniform wages across sectors. However, we could introduce wage differences between sectors, provided that exogenous variables explain each wage differentiation, without any detriment to the analytical consistency of the model.

$$P^T = (1 + m^T)(a_{TT}P^T + a_{NT}P^N + a_{MT}P^M + wl^T) \tag{3.2.3}$$

$$P^N = (1 + m^N)(a_{TN}P^T + a_{NN}P^N + a_{MN}P^M + wl^N) \tag{3.2.4}$$

Where a_{ij} denotes the fixed technical coefficient of input i required to produce one unit of good j.

By manipulating equation (3.2.4) algebraically, we obtain:

$$P^N = \frac{(1+m^N)(a_{TN}P^T + a_{MN}P^M + wl^N)}{1-(1+m^N)a_{NT}} \tag{3.2.5}$$

Then, substituting equation (3.2.5) into equation (3.2.3), we obtain:

$$P^T = a_{NT}\frac{(1+m^T)(1+m^N)(a_{TN}P^T + a_{MN}P^M + wl^N)}{1-(1+m^T)a_{NN}} + (1 + m^T)(a_{TT}P^T + a_{MT}P^M + wl^T)$$

(3.2.6)

Dividing both sides of equation (3.2.6) by P^T and substituting equations (3.2.1) and (3.2.2), we obtain:

$$1 = a_{NT}\frac{(1+m^T)(1+m^N)(a_{TN} + a_{MN}\left(\frac{P^M{}_*}{P^{T*}}\right) + \frac{1.W}{P^{T*}.e}l^N)}{1-(1+m^T)a_{NN}} + (1 + m^T)(a_{TT} + a_{MT}\left(\frac{P^M{}_*}{P^{T*}}\right) + \frac{1.W}{P^{T*}.e}l^T)$$

(3.2.7)

Finally, we can express equation (3.2.7) in terms of an implicit function to analyze the impact of changes in exogenous variables on relative prices and distributive variables (m^T, m^N and W), such that:

$$1 = \emptyset(m^T, m^N, W, e, P^{T*}, P^{M*}) \tag{3.2.8}$$

Since non-tradable goods (N) are used as inputs in the production of tradables (T), and tradables are used as inputs in the production of non-tradables, their mark-ups are inversely related, implying $\frac{dm^T}{dm^N} = -\frac{\frac{\partial\emptyset}{\partial m^N}}{\frac{\partial\emptyset}{\partial m^T}} < 0$. The reason is straightforward: the mark-up in the non-tradable sector affects the cost of the tradable sector, whose international price is exogenously determined and can only adjust if the nominal exchange rate depreciates. On the other hand, the mark-up in the tradable sector influences input costs in the non-tradable sector, whose prices are set in domestic currency and, by assumption, do not adjust instantaneously to compensate for the cost increases caused by nominal depreciation (price adjustments in the non-tradable sector occur with a lag).

In this case, nominal exchange rate depreciation immediately raises the domestic prices of tradable and imported goods, while non-tradable prices and nominal wages react with a delay. Therefore, in the short run (defined here as the period before the inflationary process set off by the depreciation unfolds), a depreciation of "e" increases: (i) $\frac{P^T}{P^N}$, (ii) $\frac{P^M}{P^N}$, (iii) $\frac{P^T}{W}$ and (iv)

$\frac{P^M}{W}$. As a result, in the short run, a depreciation of the nominal exchange rate initially raises the real mark-up of the tradable sector (m^T), reduces the real wage b, and lowers the real mark-up of the non-tradable sector (m^N).

3.3. EXCHANGE RATE AND DISTRIBUTIVE INCOMPATIBILITY

This section aims to clarify the connection between changes in relative prices and variations in one of the main drivers of price and wage adjustments: distributive incompatibility. In our analysis, the long-run outcomes of changes in real distributive variables (real wage and profit rate) are explained by the inflationary process. Thus, we assume that the relationship between the nominal exchange rate, the inflation level, and the functional income distribution follows a specific causal order: (i) depreciations of "e" generate short-run initial changes in the vector of relative prices ($\uparrow \frac{P^T}{P^N}$), which in turn alter the real distributive variables;[143] (ii) these short-run changes in distributive variables act as a trigger for inflation acceleration; (iii) inflation induces new changes in the vector of relative prices and partially reverses the initial distributive effects.[144] From this perspective, as argued by Morlin (2023, p. 771), "Inflation is thus a transition between two different long period positions". Note, therefore, that the depreciation of the nominal exchange rate generates its set of impacts on the price system and the functional distribution of income because changes in "e" temporarily influence e_r.

The mechanism through which changes in the nominal exchange rate lead to generalized increases in prices and nominal wages closely resembles the structuralist inflation models, especially as described by Olivera (1967) and Canavese (1982). In structuralist theory, changes in relative prices constitute an inflationary impulse that may spread through a dynamics of price and wage adjustments.

However, as clarified by inertialist and especially conflicting-claims models, the distributive incompatibility between workers' target real wages and firms' target real mark-ups is a positive function of the real exchange rate (and not of the nominal exchange rate). One of the core arguments of conflicting-claims models is that real exchange rate depreciation increases the share of the external sector in the gross income of the private sector and reduces

[143] As already discussed in the other three models, this situation refers to the case in which the depreciation of the nominal exchange rate is also a depreciation of the real exchange rate.

[144] In this case, the partial reversal of relative prices refers to the appreciation of the real exchange rate in the interval between depreciations of the nominal exchange rate, resulting from domestic inflation. The reversal is partial if the growth rates of nominal wages and non-tradable prices are lower than the growth rate of e.

the residual portion to be distributed between wages and profits. As a result, given the target real wage and real mark-up levels of workers and firms, increases in e_r push the actual remunerations of both classes away from their targets. Accordingly, higher distributive incompatibility implies more intense adjustments of prices and nominal wages, as both firms and workers experience losses in real income and move away from their respective targets. Thus, depreciations of "e" intensify conflicting claims when they also lead to depreciations of e_r.

It is also worth recalling from Chapter 2 that changes in the real exchange rate ($\hat{e}_r$) fluctuate within the bounds set by changes in the nominal exchange rate ($\hat{e}$), because $\uparrow e$ causes $\uparrow P$. In our framework, the nominal exchange rate is treated as an exogenous variable, so the real exchange rate becomes an endogenous outcome of the inflationary dynamics triggered by $\hat{e}$. In this context, maintaining inflation and distributive incompatibility at persistently high levels depends on successive rounds of nominal depreciation, since domestic inflation gradually offsets the initial distributive effects of real exchange rate depreciation. Therefore, if nominal depreciation ceases, the subsequent appreciation of the real exchange rate will reduce distributive incompatibility over time.

Given the logic of conflicting claims models and the analytical challenges involved in extending this framework to an open economy, we argue that the effects of $\uparrow e_r$ must be formalized exclusively through the widening of gaps between actual and targeted real wages – that is, through increases in $(b^w - b)$ and $(b - b^k)$. As mentioned in section 2.4, following real exchange rate depreciation, we assume that firms maintain their target real mark-up, which requires a lower target for real wage (b^k) – in other words, b^k is an inverse function of e_r. Conversely, workers maintain their target real wage (b^w) but must raise the nominal wage growth rate because the actual real wage falls when e_r rises – i.e., b is an inverse function of e_r.

Therefore, in the context of increased distributive incompatibility, nominal wages and prices must rise more quickly in order to prevent real wages and real mark-ups from diverging further from their respective targets. It is important to emphasize, however, that two elements are always present in the dynamics of rising P and W: (i) the magnitude of each adjustment, and (ii) the frequency of adjustments.[145] These two factors are central to understanding the mechanisms through which increases in the frequency of nominal exchange rate depreciation lead to increases in the frequency of price and wage adjustments.

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[145] As described by Serrano, Summa, Morlin (2024).

3.4 EXCHANGE RATE AND THE FREQUENCIES OF PRICE AND NOMINAL WAGE ADJUSTMENTS

Given the relationships discussed so far between nominal exchange rate depreciation "$\uparrow e$", distributive incompatibility $(b^w - b^k)$,[146] inflation $(\hat{P})$, and the real exchange rate e_r, we aim to analyze the mechanisms that explain the positive relationship between exogenous increases in the frequency of nominal exchange rate depreciations (N^e) and increases in the frequencies of nominal wage adjustments (N^W) and price adjustments (N^k). We argue that there is an indirect transmission channel from e to N: (i) increases in N^e accelerate the inflation rate, and (ii) accelerating inflation increases both N^W and N^k.[147]

We know that the process of nominal wage and price adjustments must be analyzed through two components: (i) the magnitude of each adjustment and (ii) the frequency of adjustments. Regarding (i), we rely on the analytical simplification proposed by Serrano, Summa, and Morlin (2024), assuming that each adjustment is set at a magnitude necessary to "close" the gap between the actual real remuneration and the respective class target – meaning that nominal wage adjustments by workers are determined by $(b^w - b)$, and price adjustments by firms are determined by $(b - b^k)$.

It is important to note, however, that the gap between the actual real remuneration and a class's target reflects a key element: the larger this gap, the lower the class's ability to keep actual real remuneration close to its desired level. Thus, a wide gap can be interpreted as an indicator of low bargaining power for the class in question. This relationship between the distance from the target and bargaining power can also be related to the concept of the degree of flexibility of real remuneration, as proposed by Olivera (1967) and Canavese (1982). Accordingly, contexts in which actual real wages deviate significantly from class targets correspond to situations of high real remuneration flexibility for both real wages and real mark-ups. Therefore, the existence of large gaps between actual real remuneration and the targets $((b^w - b)$ and $(b - b^k))$ necessarily indicates that both classes have limited capacity to protect themselves from inflationary losses.[148]

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[146] Note that $(b^w - b^k)$ is equal to the sum of the gaps between the real wage targets of each class and the effective real wage $((b^w - b) + (b - b^k))$.

[147] The appreciation of the nominal exchange rate generates the opposite effect by reducing distributive incompatibility.

[148] Consequently, the opposite also holds: if the inflationary process does not result in large gaps between the effective real wage and the wage targets $((b^w - b)$ and $(b - b^k))$ over a given reference period, the degree of

Revisiting some of the key analytical contributions of the inertial inflation theory and the models developed by the CEPG, we argue that the ability of agents to resist against real income losses caused by inflation is directly related to the degree of indexation of nominal remunerations to past inflation.[149] This degree of indexation, in turn, depends on the agents' capacity to shorten the intervals between nominal wage and price adjustments. Ultimately, based on Serrano, Summa, and Morlin (2024, pp. 13–15), we understand that the frequencies of these adjustments – both for wages and prices – are directs expressions of each class's bargaining power.

Thus, by integrating the analytical contributions of the various models discussed, we identify two important relationships: (i) the magnitudes of price adjustments are determined by $(b - b^k)$, while wage adjustments are determined by $(b^w - b)$; and (ii) The rigidity of real mark-ups and real wages in response to deviations from class targets closely corresponds to the notion of bargaining power.[150] Hence, the magnitude of each round of wage and price adjustment is a negative function of the rigidity of real remuneration relative to target deviations – meaning it is a negative function of each class's bargaining power.[151]

Finally, the logic underlying the positive relationship between rising inflation and increasing adjustment frequencies is that discussed by Pazos (1972) and the inertialist models. According to these previous contributions, accelerating inflation causes faster declines in real remunerations while nominal remunerations remain unchanged. Thus, for fixed intervals between adjustments, inflation acceleration reduces both real mark-ups and real wages. In this context, the increase in the frequency of nominal adjustments – in other words, the shortening of the intervals these variables remain fixed – becomes necessary. As inflation accelerates, the maximum tolerable deviation between actual real remuneration and the target is reached in ever shorter periods.

If we define minimum acceptable levels of real remuneration in relation to class targets under inflation – that is, if each class is capable of enforcing a minimum real remuneration threshold beyond which it no longer tolerates losses – then the frequency of adjustment becomes

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resistance of the classes to real income losses caused by the inflationary process is high (i.e., there is a low degree of flexibility).

[149] It is useful to recall from Chapter 1 that a reduction in the intervals between nominal wage adjustments corresponds to an increase in adjustment frequencies, given a specific reference period. For example, given a one-year reference period, a reduction in the adjustment interval from semiannual to quarterly corresponds to an increase in the annual adjustment frequency from two to four.

[150] The notion that a class holds strong bargaining power is incompatible with a situation in which its actual real remuneration is significantly lower than its own target.

[151] If we consider a given level of inflation, the greater the bargaining power of each class, the more frequent the adjustments and the smaller the magnitude of each adjustment. Conversely, the lower the bargaining power of each class, the less frequent the adjustments and the greater the magnitude of each adjustment.

a strictly increasing function of the inflation rate. The higher the inflation, the higher the frequency of adjustments must be. Therefore, since rising inflation levels require a higher degree of indexation of nominal variables in order to maintain a given resistance level of real variables against inflationary losses – which translates into more frequent price and wage adjustments –, we can complete the logic behind the transmission mechanism from changes in the nominal exchange rate to the adjustment frequencies.

(i) More frequent nominal exchange rate depreciations ($\uparrow N^e$) initially lead to real exchange rate depreciation; (ii) real exchange rate depreciation increases distributive incompatibility; (iii) rising distributive incompatibility prompts firms and workers to accelerate the growth of prices and nominal wages, which in turn increases inflation; (iv) accelerating inflation forces agents to increase the frequency of price and wage adjustments; (v) the inflation is again accelerated because there is a positive relationship between distributive incompatibility and the adjustment frequencies — meaning that real exchange rate depreciation raises inflation through a dual channel: it increases distributive incompatibility and the frequency of adjustments; (vi) as inflation rises during periods in which "*e*" remains constant, the real exchange rate appreciates, and distributive incompatibility temporarily decreases; (vii) as a result, the frequency required for new rounds of nominal exchange rate depreciation (N^e) to maintain the real exchange rate close to some higher target level increases. Therefore, to maintain a persistently increased real exchange rate, that generates higher inflation, it becomes necessary new increases in N^e because the increase in inflation induces rises in N^K and N^W.

In the dynamics described, the inflationary impulse originates from the depreciation of the nominal (and real) exchange rate, and the conflicting claims over distribution intensifies as a result. The dynamics described in the model yields what we call a nominal exchange rate-price-wage spiral. In this case, given nominal exchange rate depreciation, inflation accelerates – but as inflation accelerates, further depreciations of "*e*" must also become more frequent.

We understand that the class most successful in aligning its actual real remuneration with its target is the one that manages to raise its adjustment frequency the most. Thus, in the inflationary process, the equilibrium outcome of functional income distribution depends on the relative frequencies of price, wage, and exchange rate adjustments, while the equilibrium inflation level depends on their absolute frequencies. If N^K and N^W are higher than N^e, the real exchange rate appreciates and distributive incompatibility decreases.[152] The equilibrium

[152] On the other hand, if N^e is greater than N^K and N^W, the real exchange rate depreciates and distributive incompatibility increases.

inflation rate will be higher the higher N^K, N^W and N^e are – and lower the smaller these variables are.

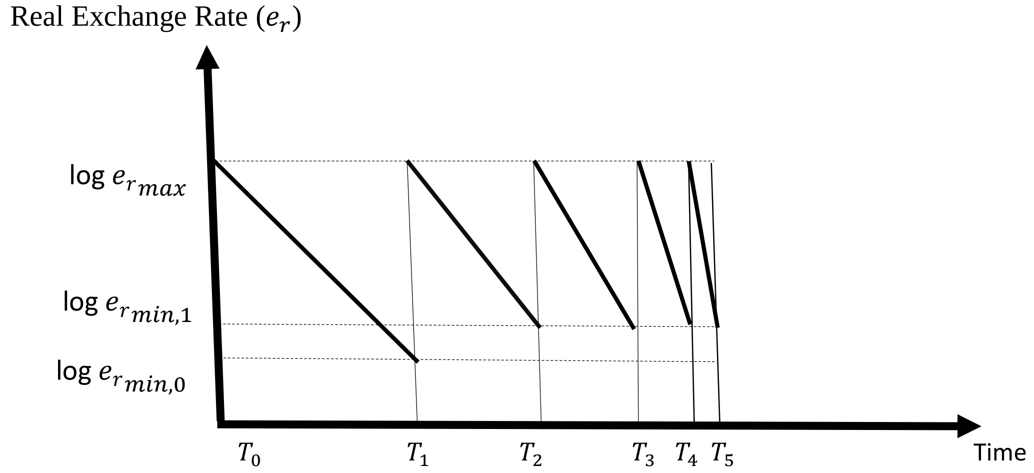
3.5. ANALYTICAL ASPECTS OF HYPERINFLATION

Given the discussion presented in the previous sections, the path to unlimited acceleration of the inflation rate becomes immediately clear: the coexistence of a positive distributive incompatibility with increases in the frequencies of nominal exchange rate, price, and wage adjustments. The models on which our analysis is based describe dynamics of price and wage increases that converge to equilibrium levels in which the growth rates of these variables become equal and stabilize across successive periods ($\hat{P} = \widehat{W} = \hat{P}_{t-1} = \widehat{W}_{t-1}$), according to given levels of adjustment frequencies (N^W and N^k) and levels of distributive incompatibility ($b^w - b^k$). Considering the influence of changes in "*e*" on inflation, on conflicting claims over distribution (through changes in e_r), and of N^e on N^W and N^K, it is necessary to add that the condition for the inflationary process to converge to an equilibrium is that $\hat{e} = \hat{P} = \widehat{W} = \hat{e}_{t-1} = \hat{P}_{t-1} = \widehat{W}_{t-1}$, with a constant N^e across successive periods – generating constant frequencies for N^W and N^k, and constant levels of distributive incompatibility ($b^w - b^k$).

Since the inflation equilibrium described in the model is defined by given levels of e_r, the fluctuation of the real exchange rate and distributive incompatibility between successive "*e*" adjustments has important analytical implications. In this context, the inflation dynamic consists of a sequence of dampened impulse periods, so that the real exchange rate should be analyzed based on its average value over the intervals between successive depreciations of "*e*".

Therefore, in the absence of supply shocks and foreign inflation, inflation rate stability requires that the depreciation dynamics of "*e*" be set at a fixed frequency and with a magnitude determined by the total accumulated inflation over the period between adjustments. In such a situation, where the nominal exchange rate becomes indexed to past inflation, the same peak of e_r is reached at the beginning of each period and the same minimum value of e_r is reached immediately before the next depreciation of "*e*". The reason why a depreciation pattern of this nature (a crawling-peg regime) is necessary is that it ensures that the average real exchange rate over the period can be maintained across successive intervals.

Graphically, we can represent the variations in e_r averaged over the intervals corresponding to a situation of successive increases in N^e. As the depreciation of the real exchange rate accelerates price and wage adjustments, an increase in N^e induces a rise in $\hat{P}$. Thus:



Graph 10. Real exchange rate trajectory in the intervals between nominal exchange rate adjustments under increasing adjustment frequency of "*e*". Own elaboration.

In Figure 10, we represent a situation in which the real exchange rate depreciates on average across intervals, but at the cost of ever shorter intervals between nominal exchange rate adjustments (i.e., a positive growth in N^e). The trajectory of the real exchange rate shown in the figure can be justified by the following logic: when the real exchange rate depreciates due to more frequent inflationary shocks ($\uparrow e$), inflation rises, and consequently, the real exchange rate appreciates more quickly within the intervals between adjustments. However, insofar as a depreciation of the average real exchange rate across intervals is sought, it becomes necessary to shorten even further the intervals between nominal exchange rate depreciations. But this additional shortening corresponds to increasingly frequent inflationary shocks – and so on, in a self-reinforcing process. The figure also illustrates a situation of complete resistance of the average real exchange rate to depreciation starting from period T_1.

From the theoretical and analytical perspective developed in this dissertation, we interpret hyperinflationary processes as attempts to devalue e_r that, in order to be sustained under inflationary conditions, require the frequency N^e to accelerate faster than N^W and N^k. In such a case, the nominal exchange rate-price-wage spiral may have no intrinsic limit, such that, for a given target value of e_r pursued by economic policy through $\hat{e}$, the frequencies N^e, N^W and N^k increase without limit[153] – because the real exchange rate becomes fully resistant at a high

[153] It is worth recalling that the nominal exchange rate is treated as an exogenous variable in our analysis.

level, as discussed in Franco (1986). In inflationary processes of this kind, nominal exchange rate depreciations tend to follow an accelerationist dynamic.

In the literature, another aspect considered relevant in hyperinflation is the progressive loss of function of the domestic currency as domestic inflation accelerates – which, in turn, may stimulate capital flight, creating an additional factor behind the trend toward acceleration of nominal exchange rate depreciation. As briefly stated by Lopes (1989, pp. 41–42), the domestic currency is initially stripped of its function as a store of value, as it ceases to be a desirable instrument for transferring purchasing power over time.[154] Later, it also loses its function as a unit of account, as nominal variables become indexed to some reference price index – which, over time, becomes a more relevant unit of account than the domestic currency itself. Finally, when all nominal variables become indexed to the nominal exchange rate (e.g., to the U.S. dollar), the currency may gradually lose its function as a means of payment. In this regard, Lopes (1989) highlights that:

> Finally, with daily indexation to the parallel dollar, the substitution of the economy's reference currency is completed. Payments and receipts may continue to be made in legal currency, as in fact occurred until nearly the end of the German hyperinflation, but the unit for quoting prices, wages, and values in general is the foreign currency. This transformation in the indexation structure – culminating in full conversion to foreign currency – can only occur at the cost of an enormous acceleration in the inflation rate, which in itself suffices to explain the transition from open inflation to hyperinflation. (Lopes, 1989, p. 42)[155]

There is a practical aspect related to the introduction of indexation of nominal variables to the dollar. The intensification of indexation to past inflation leads to increasingly shorter periods during which nominal variables remain constant. As described by Lopes (1989), Franco (1986), and Simonsen (1995), this process may reach a point where the general price index itself becomes insufficient as a reference unit for nominal price and wage adjustments. In this case, the update frequency of the general price index becomes lower than the adjustment frequencies of prices and wages, and hence the nominal exchange rate is adopted as the reference variable for indexation as a solution. It is essential to emphasize that the progressive intensification of indexation, which occurs simultaneously with accelerating inflation, generates strong resistance from both real wages and real mark-ups against losses caused by inflation. In this context, the real exchange rate also becomes resistant to depreciations caused by nominal exchange rate devaluations, since all nominal variables are now indexed to the exchange rate. Therefore, when nominal wages and prices are perfectly indexed to the nominal exchange rate, variations in the latter no longer alter relative prices.

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[154] In this case, "o uso da moeda restringe-se ao mínimo estritamente necessário para realizar transações." (LOPES, 1989, p. 41).

[155] Own translation.

It is important to note that, given the logic of indexation to dollar that necessarily arises in hyperinflationary processes, the explanation for inflation acceleration always hinges on accelerationist frequencies of nominal exchange rate depreciation. In the hypothetical case where the frequency of nominal depreciations becomes lower than the frequencies of price and wage adjustments, the real exchange rate and distributive incompatibility would persistently fall, and the conflicting claims would diminish – reducing the growth rates of prices and wages. Thus, we conclude from the open economy analysis that the frequency of exchange rate depreciations determines the frequencies of price and wage adjustments.

CONCLUSION

This dissertation conducted an analytical assessment of the foundations of cost-push inflation theories through a study of four groups of models: structuralist, inertialist, conflicting claims, and the Cambridge Economic Policy Group (CEPG) models. It was argued that a coherent analysis of the inflationary process must consider the interaction of four central elements: (i) exogenous variations in relative price; (ii) conflicting claims over distribution; (iii) frequencies of adjustments; and (iv) inertia (a direct result of both conflicting claims and frequencies of adjustments).

This dissertation discussed the logic of the interrelations among these elements. From a theoretical and analytical perspective, the formal representation of exogenous variables that generate relative price changes among different commodity groups play a decisive role, as it enables understanding the inflationary and distributive impacts of exogenous shocks that are crucial to inflation dynamics. However, incorporating relative price changes only yields relevant contributions to the analysis of the inflationary process when connected to the conflicting claims over distribution perspective, in which firms and workers attempt to secure increases in their real remuneration by means of nominal adjustments. When inflation is driven by conflicting claims over distribution (i.e., distributive incompatibility), understanding the growth rates of prices, nominal wages, and the nominal exchange rate requires incorporating the frequencies of adjustments of these nominal variables into the analysis. Lastly, it was argued that the indexation of prices, wages, and the nominal exchange rate to past inflation is intrinsically related to the dynamics of conflicting claims, forming a component of inertia in persistent inflationary processes.

In structuralist theory, the explanation of inflation combines relative price changes with conflicting claims over distribution. In this sense, exogenous variables that raise the prices of a specific group of goods generate significant inflationary shocks because they cause short-run distributive changes. The goods whose prices have increased are part of workers’ consumption baskets and constitute direct or indirect cost components in the production of all other goods. In this context, the initial increase in the prices of a given group of goods initially causes a generalized decrease in real wages and real mark-ups across all other goods whose prices remain fixed. In response to these reductions in real remuneration, firms and workers react by adjusting prices and wages. It should be noted that the wage-price spiral that follows the initial relative price change tends to partially reverse the initial relative price movement – provided that the exogenous variables behind the initial shock do not generate new impulses that restart the inflationary dynamic. In an open economy, nominal exchange rate depreciations play a decisive role as a causal mechanism for temporary relative price changes with distributive and inflationary repercussions.

In inertialist models, in addition to the structuralist logic of the interaction between relative price changes and the generalized wage-price spiral (resulting from the inverse relationship between real wages and real mark-ups), there is an effort to provide an analytical account of the mechanisms through which nominal remunerations are indexed to past inflation. In such models, the basic explanation of inflation consists in the combination of relative price changes with the adjustment frequencies of wages, prices, and exchange rates – which result from generalized indexation mechanisms. In the open economy context, these models argue for an inverse relationship between real wages and the real exchange rate.

In conflicting claims models, given some positive distributive incompatibility, nominal wages and prices are assumed to be adjusted simultaneously. To incorporate the features of an open economy, this group of models introduces the real exchange rate as an exogenous variable. In this framework, real exchange rate depreciation increases the conflict between real wages and real mark-ups, while its appreciation reduces distributive conflict.

In CEPG models, based on a distributive conflict framework, the price-wage spiral is explained by attempts of firms and workers to realize their target real remuneration. In these models, inflation dynamics are driven by a combination of distributive incompatibility and the frequencies (or periodicities) of price and wage adjustments.

In line with Serrano, Summa, and Morlin (2024), this dissertation argued that the equilibrium inflation rate is a positive function of both the magnitude of distributive incompatibility and the adjustment frequencies of prices and wages. On the other hand, the equilibrium configuration of functional income distribution depends on the relative frequencies of price and wage adjustments and the magnitude of distributive incompatibility. In open economy context, as domestic inflation appreciates the real exchange rate and reduces distributive incompatibility during the intervals between nominal exchange rate depreciations, the persistence of the inflationary process requires new rounds of nominal exchange rate depreciation to maintain a depreciated real exchange rate and a positive level of distributive incompatibility on average during those intervals. In this framework, the real exchange rate is an endogenous outcome of the interaction between the nominal exchange rate growth rate and the inflation rate.

Finally, based on the analytical framework developed throughout the dissertation, the study discussed the analytical aspects of hyperinflation, which give rise to accelerationist dynamics in the nominal exchange rate-price-wage spiral, with no intrinsic limits to the growth rates of these variables. The key aspect in explaining inflationary processes is the combination of positive distributive incompatibility with accelerating frequencies of adjustments of the nominal exchange rate, prices, and wages. This dissertation argued that the frequency of nominal exchange rate adjustments determines the frequencies of adjustment of prices and wages, such that the unlimited acceleration of inflation is explained by the exchange rate depreciations. Since, in this analysis, the inflationary process stems from the coexistence of positive distributive incompatibility and adjustment frequencies, it is implicit that if the real exchange rate appreciates on average and thereby reduces distributive incompatibility, the very process of price and wage adjustments would tend to eliminate the distributive incompatibility that justifies inflation persistence. Accordingly, inflation stabilization requires prior stabilization of the nominal exchange rate, which in turn allows inflation to appreciate the real exchange rate to a level compatible with stable nominal prices and wages.

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