



HAL
open science

Inflation Regimes and Hyperinflation. A Post-Keynesian/Structuralist typology

Sébastien Charles, Eduardo Figueiredo Bastian, Jonathan Marie

► **To cite this version:**

Sébastien Charles, Eduardo Figueiredo Bastian, Jonathan Marie. Inflation Regimes and Hyperinflation. A Post-Keynesian/Structuralist typology. 2021. hal-03363240

HAL Id: hal-03363240

<https://hal.science/hal-03363240>

Preprint submitted on 3 Oct 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Texto para Discussão 032 | 2021

Discussion Paper 032 | 2021

Inflation Regimes and Hyperinflation. A Post-Keynesian/Structuralist typology

Sébastien Charles

Université Paris 8, LED

Eduardo F. Bastian

Universidade Federal do Rio de Janeiro, Instituto de Economia

Jonathan Marie

Université Sorbonne Paris Nord, CEPN

This paper can be downloaded without charge from

<https://www.ie.ufrj.br/publicacoes-j/textos-para-discussao.html>

Inflation Regimes and Hyperinflation.

A Post-Keynesian/Structuralist typology

Outubro, 2021

Sébastien Charles

Université Paris 8, LED
sebcharles92@yahoo.fr

Eduardo F. Bastian

Universidade Federal do Rio de Janeiro, Instituto de Economia
eduardobastian@ie.ufrj.br

Jonathan Marie

Université Sorbonne Paris Nord, CEPN
jonathan.marie@univ-paris13.fr

Abstract

The article proposes a typology of inflation regimes that can be applied to any kind of economy based on the Post-Keynesian and structuralist literature. We identify three separate regimes: the low, moderate, and high inflation regimes. Hyperinflation is also defined and described. Each regime presents different characteristics. We identify the key role played by the distributive conflict between workers and capitalists in all the regimes, the role played by the indexation of wages on domestic prices in the moderate and high inflation regimes, and the specific roles played by the widespread indexation on a short term basis in the high inflation regime. Hyperinflation is explained by self-fulfilling prophecies about exchange rate variations and by the rejection of the domestic currency. Our analysis underlines the fact that the current fear of inflation is largely groundless.

Keywords: Inflation, Hyperinflation, Post-Keynesian analysis, Structuralist analysis

JEL Codes: B5; E12; E31

1 Introduction

Due to the demand for more active fiscal policies in response to the Covid-19 crisis and especially since the announcement and adoption of emergency fiscal measures by the U.S. Government during the first semester of 2021, we observe a resurgence of the “fear of inflation” rhetoric, underlined among others by the FT columnist M. Wolf on March 26, 2021.¹ This rhetoric has been spread by opponents of Keynesian tools, who disregard policies designed to increase effective demand. Adopting the theoretical framework of “New Consensus” and mobilizing notions such as the output gap, some recent contributions (e.g. Landau, 2021) insist on the potential inflationary impact of fiscal stimuli. They call for the preservation of the current regime – wherein monetary policy is regarded as the core macroeconomic policy – instead of adopting the type of regime recommended by Keynesian economists – wherein fiscal policy assumes this role (e.g. Charles et al., 2021). This reaction comes as no surprise: the risk of uncontrolled inflation has been the core argument against Keynesian demand-management policies at least since the end of the 1960s. As underlined among others by López Gallardo and Mansilla (2007, p. 81), “Fear of inflation was one of the initial reasons for abandoning expansionary demand policies in advanced capitalist economies”. Atesoglu (1997, p. 639) writes that “fear of inflation becomes a pretense for monetary policy makers to maintain restrictive aggregate-demand policies with the resultant high unemployment rates, even when inflation is low in term of historical standards”. We believe this story should not happen again in the current context as economies worldwide will face – after the pandemic ends – sundry challenges in terms of unemployment, economic development, and ecological transition. Hence, it is mandatory to mobilize active aggregate-demand policies.

In this context, it is essential to determine the causes of inflation (Bivens, 2021) and to present an explanation of inflation dynamics indicating that the inflation problem is not an immediate issue, and thus there is no reason why countries should be too careful as regards adopting expansionary policies. However, though episodes of high inflation and hyperinflation have been rare events in the last two decades and are unlikely to occur in

¹ <https://www.ft.com/content/6cfb36ca-d3ce-4dd3-b70d-eccc332ba1df>

the short run, understanding inflation dynamics – and how hyperinflation episodes emerge – remains a current and relevant topic. Such an understanding is relevant to anticipating the consequences of economic policy measures on inflation and on distribution in the medium and long run. In sum, this paper aims at presenting tools for understanding inflation as a means to fight the unwarranted fear of inflation that restricts economic policies.

As we justify afterwards, our theoretical proposals mobilize different mutually consistent sources. Indeed, our typology is fully in line with the taxonomy proposed by Vernengo (2005): two decisive characteristics permit us to define the perimeter of our references. Firstly, money is endogenous. This characteristic means we can dismiss the influence of theories that claim a causal relation from quantity of money to inflation. This rejection seems very natural for at least two reasons: the causality from quantity of money to inflation is hard to prove and remains fragile (De Grauwe and Polan, 2005) and the hypothesis of the exogeneity of money appears very unrealistic.² Secondly, we wish to adopt a cost-push view of inflation – in line with the Post-Keynesian tradition – instead of a demand-pull view of inflation that appears too mechanical.³ As highlighted by Vernengo (2005, pp. 22-23), this second characteristic allows us “to emphasize the fact that the main distinction between conventional wisdom and all unorthodox views of inflation depends on whether some extraneous element forces inflation into a system that would otherwise work perfectly, generally in the form of government’s excessive money printing, or if social conflicts and structural limitations are ultimately resolved by inflation, typically by allowing costs to increase”.

² The idea that money is endogenous has been increasingly accepted. See for instance, Sheard (2013) and McLeay et al. (2014).

³ By demand-pull theories of inflation, we mean all the theories that explain inflation as a mechanical consequence of scarcity and of market forces. For example, the Phillips curve models of inflation emphasize the mechanical link between the level of unemployment and inflation. Here, we admit the level of inflation can be influenced by the level of unemployment, but also by other economic factors and by the institutional context (see section 2). Thus, following Pérez Caldentey et al. (2020, p. 88), we assume “there is no reason to expect an unambiguous or systemic relation between prices and quantities”.

In this paper, we adopt a Post-Keynesian⁴ and structuralist theoretical framework. In such a theoretical framework, the money supply cannot be the cause of the level of prices because money is endogenous. Furthermore, Post-Keynesians usually reject the existence of the NAIRU,⁵ as they do not recognize the existence of output gaps, endogenous or natural equilibrium inflation rates. As Keynes himself proposed (1936, p. 309) “the long run stability or instability of prices will depend on the strength of the upward trend of the wage-unit (or, more precisely, of the cost-unit) compared with the rate of increase in the efficiency of the productive system”. The core variable to observe while studying inflation dynamics is the behavior of cost variables like the changes in wages (Robinson, 1964), mark-ups and other cost shocks like exchange rate devaluations.

More precisely, this paper develops a typology of inflation regimes based on some earlier Post-Keynesian and Structuralist contributions – for instance Robinson (1951), Noyola-Vasquez (1956), Sunkel (1960), Kalecki (1962) and Pazos (1963, 1972) or even Dutt (1987), Lavoie (1992) and Carvalho (1992, 1993) – plus some recent contributions that theoretically and empirically analyze inflation regimes and hyperinflation episodes based on lessons from this earlier literature. This renewed interest in inflation regimes and hyperinflation from a Post-Keynesian/Structuralist perspective includes for instance the works of Marie (2014), Charles and Marie (2016, 2017, 2020, 2021), Bastian and Setterfield (2015, 2020), Vera (2017), Kulesza (2017), Drabo (2018), or Desmedt (2021).⁶ Hence, the typology is the result of an ongoing research effort that incorporates these recent contributions.

Our typology identifies the sources of inflation and underlines the links between inflation and functional income distribution. To put it in a nutshell, this paper aims at presenting the different inflation regimes and at understanding hyperinflation in a pedagogical

⁴ By Post-Keynesian, we understand the broad definition proposed by Lavoie (2014) that incorporates different traditions like Fundamentalist Keynesians, Kaleckians, Sraffians, Kaldorians and Institutionalists.

⁵ For an exception, see for example Stockhammer (2008). In this paper, the author argues that the NAIRU model can be consistent with the Post-Keynesian theory of inflation wherein inflation is due to real distributional conflict and, equilibrium is unstable.

⁶ The work on inflation as a conflicting claims phenomenon of some Sraffian economists – like for instance Stirati (2001), Bastos (2002) and Serrano (2010) – has close connections with the works we use here.

manner. In so doing, we understand the specific roles played in an inflationary course by the distributive conflict, indexation and other cost-push elements (exchange-rate, financial costs, etc.) and we explain to what extent these elements do or do not play an important role in a specific context.

We use the term “inflation regime” because we aim at describing different institutional frameworks which generate different inflation dynamics. Our regimes are a form of ideal types. In each regime, we identify specific institutional characteristics or conventions, such as specific formal or informal rules existing in an economy, or specific patterns stemming from economic agents.⁷ As a result, the inflation dynamics in each regime present specific characteristics, beyond the simple increases in price levels. For instance, these different characteristics include the presence or absence of inertia, or the degree of sensitivity of prices or wages to the exchange rate dynamics. Moreover, the concept of regime refers to the notion of stability, in the sense that a regime is prone to endure for a certain time. This definition is compatible with the definition of an institutional regime proposed by Setterfield and Cornwall (2002, p. 71) – which in this paper we apply to inflation – when they state that an institutional regime is a “relatively enduring macro-institutional structure within which economic behavior takes place. It constitutes the operating system that provides the social infrastructure necessary, in an environment of uncertainty and conflict, to create stability, undergird the state of long-run expectations, reconcile competing distributional demands and hence facilitate economic activity among decentralized decision makers.” The identification of each regime requires us to set ‘ideal types’. To this end, we propose qualitative criteria for each regime and for hyperinflation; the various inflation regimes are based on different institutions meaning that there are specificities in the way the economy works in each case.

⁷ As we explain further in the paper, the institutions and conventions involved in our inflation regimes include, among others, the way wages are negotiated by workers and firms and the way firms set prices (thus indirectly involving labor law or commercial law), the presence or not of indexation mechanisms, the consideration or not of exchange rates issues in determining wages or prices, etc. Of course, an economy can shift from one regime to another, and the conditions for such shifts need to be explained; in other words, we can identify what causes an institutional change in prices and wages determinations.

Our target in this paper is thus to build a typology that applies to any type of capitalist economy. Therefore, we propose definitions that are essentially qualitative instead of quantitative as was the case for instance of Cagan's (1956) classic work on hyperinflation. We also identify exogenous factors that may induce the move from an inflationary regime towards another one. It may be observed that the analysis proposed here insists on the role played by external factors (instability of international prices or of exchange rates for example). In this regard, we identify in this paper three core inflation regimes: 1) the low inflation regime, which we describe in the second section; 2) the moderate inflation regime, which we discuss in the third section; 3) the high inflation regime, which we analyze in a fourth section. In a fifth section, we identify the characteristics of hyperinflation and propose a qualitative definition of this phenomenon. Hence, the combination of the three regimes – plus hyperinflation episodes – constitutes our typology of inflation regimes and of hyperinflation.⁸

An economy can obviously switch from one regime to another, and there are sundry historical inflationary paths among economies. This is incidentally one of the reasons why it is so important to build a typology of inflation regimes that specifies their characteristics and fragilities and how an economy moves from one regime to another. The economic policy (fiscal and monetary tools) can be constrained by the inflationary regime and priorities of the economic policy should change with the inflationary context. In other words, the different regimes have different properties and may induce specific macroeconomic dynamics (Bastian and Setterfield, 2015). A regime change necessarily implies institutional changes. It is important for the economist or the economic policy maker to understand such characteristics. In return, hysteresis can make the path from a high inflation regime to a moderate inflation regime difficult, as it may be very challenging for a country hit by hyperinflation to restore a unit of account and to stand on a path of sustainable growth with low inflation.

⁸ Carvalho (1992) discusses inflation regimes like the low inflation regime, which he calls the equilibrium inflation regime, and the high inflation regime. However, he ignores the moderate inflation regime. And regarding hyperinflation, as we will explain hereafter, we insist on the role played by anticipations about the exchange rate to define hyperinflation whereas Carvalho maintains that hyperinflation is a “coordination breakdown”.

Finally, our typology reaffirms the need for fiscal stimuli in the face of the Covid-19 crisis: as most economies currently exhibit the characteristics of a low inflation regime, the fear of inflation is groundless.

2 The Low Inflation Regime

In the low inflation regime, inflation is due to the distributive conflict between workers, the wage earners, and capitalists, the profit earners. The low inflation regime corresponds to the basic conflicting-claims model of inflation described by Post-Keynesians like Dutt (1987) and Lavoie (1992; 2014). We can also use the term “wage-cost mark-up relation” to describe the relation that produces inflation. This regime is similar to the “equilibrium inflation regime” in the works of Carvalho (1993), but we prefer to leave aside the term equilibrium to avoid any discussion of this term.⁹

In this regime, besides wage costs, there are other costs that can fuel inflation, including the increase in financial costs, the changes in exchange rate, or increases in the prices of imported inputs.

Main Characteristics:

The low inflation regime – as we define it – describes situations wherein inflation rates are generally low and stable. Agents trust and use the country’s money of account in everyday transactions and also in long-range contracts. In fact, most countries today live under a low inflation regime, especially the wealthiest economies.

To formally describe this regime, we start by referring to the traditional wage-cost mark-up equation (Kalecki, 1971; Weintraub, 1978) that can be written:

$$p = z (w/y)$$

where p is the price level, z the mean mark-up coefficient applied to a unit of labor mobilized (with $z = (1 + m)$ and m being the mean mark-up) and w/y is the unit labor cost (with w the nominal wage and y the output per unit of labor). From this equation, we

⁹ Some authors used the term *creeping inflation* to designate the inflation dynamics in the developed countries in the decades after World War II. Accordingly, creeping inflation describes a situation wherein real wages grow in line with productivity. For details, see Morlin (2017).

understand that it is equivalent for firms to set a target in terms of real wages or in terms of a mark-up.

This equation is an identity that says nothing about the sources of inflation. But it is easy to deduce from the foregoing equation the following relation:

$$\frac{\dot{p}}{p} = \frac{\dot{z}}{z} + \frac{\dot{w}}{w} - \frac{\dot{y}}{y}$$

Here, we see that an increase in the rate of price variation ($\frac{\dot{p}}{p}$) is induced by a positive change in the mark-up and/or a positive change in the nominal wage or a decrease in productivity.

This basic equation is fundamental for our reasoning and to propose our equations describing what we call the *low inflation regime*. In the *low inflation regime*, the inflation rate is mainly due to conflicting claims between wage earners and capitalists over output (Perry and Cline, 2013); in other words, the conflict (and its resolution) between workers and capitalists over the distribution of revenue induces inflation dynamics and determines the distribution of income. In any case, it does not mean that inflation is exclusively due to the distribution conflict as we will explain later.

Hereafter, and for the sake of simplicity, we will assume productivity is constant.¹⁰ Then and formally, following Rowthorn (1977), wage inflation can be represented by the following equations proposed by Dutt (1987) and Lavoie (2014):

$$\frac{\dot{w}}{w} = \Omega (\omega_w - \omega) \tag{1}$$

Equation (1) describes how nominal wages evolve, where:

$\frac{\dot{w}}{w}$ is the rate of change of nominal wages

¹⁰ If nominal wages claimed by workers do not exceed the rate of growth of labor productivity, firms can maintain their real mark-up on labor costs without passing on in prices the increase in nominal wages. In other words, productivity gains reduce the inflation path; the fact that we do not formally take into account the productivity gains does not modify our conclusion.

ω_w is the real wage rate targeted by workers

ω is the current real wage rate

And Ω is the workers' bargaining power

ω_w and Ω are parameters determined by historical circumstances. To describe a specific situation, they need to be approximated. This is consistent with what is explained by Eichner and Kregel (1975, p.1305): "Post-Keynesian theory accepts Keynes's view that the nominal wage is for the most part exogenously determined [...] it may depend as Keynes himself emphasized, on the bargaining strength of the trade union movement." It is also fully in line with the analysis of inflation proposed by Joan Robinson who specifically insists on the role played by unions in the working of the economy and on the path inflation rates follow (see for example Williams, 1981). The workers wage target can be influenced by the rate of growth of unemployment, or the mean level of unemployment over several years; a steady increase in unemployment may induce a decrease in the wage share targeted by workers as the reserve army of workers expands and as fear of unemployment grows. The real wage rate targeted by workers may be regarded as the real wage that workers deem *fair* (see Lavoie, 2014); this value may change at different periods, but workers' experience regarding the historical record of real wages plays an important role. For example, it appears realistic to imply that workers in developed countries aimed at obtaining higher real wages during the *Fordist* period than during the contemporary *post-Fordist* era.¹¹ For its part, bargaining power (i.e. the ability to reach the target) can be determined by institutional factors such as the strength of unions. The workers' bargaining power is stronger when unionization is high; the value of this parameter is necessarily greater than or equal to 0. If $\Omega = 0$, then, workers have absolutely no chance of obtaining the value of nominal wages they desire. In an extreme case, if trade union activities are forbidden, for example by a military government, the real wage target can be high, but workers are unable to obtain nominal wage increases due to the repression of trade unions.

¹¹ Here we use the terms Fordist period and post-Fordist period as proposed in *Regulation Theory*. See for example Boyer (2004) or Jessop (1995).

Equation (2) describes the price inflation:

$$\frac{\dot{p}}{p} = \psi (\omega - \omega_f) \quad (2)$$

Where:

$\frac{\dot{p}}{p}$ is the inflation rate

ω_f is the real wage rate targeted by firms

And ψ is the firms' market power

Along the same lines, the rate of change of nominal wages, ω_f and ψ are parameters that change with circumstances. On the one hand, ω_f is usually negatively affected by the rate of capacity utilization, but in a non-linear way: in fact, experience shows that in the short run, firms would prefer to increase their rate of capacity utilization if it is lower than increasing prices, but if normal capacity utilization is reached, firms will tend to increase their mark-up target (i.e. to decrease their real wage share target). On the other hand, as observed in the real world, markets are characterized by situations of greater or lesser competition among suppliers; for Post-Keynesians, the situation of pure and perfect competition is illusory. The stronger competition is among firms, then the lower the value of ψ , which needs to be greater than or equal to 0. In a situation of pure and perfect competition, $\psi = 0$. In this situation, it is impossible for a firm to impose the price it desires. The degree of competition among firms can be positively affected by the external openness of the economy for example.

In this so-called low inflation regime, we can postulate that during each bargaining period, workers negotiate the nominal wage for the next period. Then firms set prices, seeking to achieve a price level compatible with their desired mark-up. The inflation rate is therefore the consequence of the gap between the mark-up sought by firms and the real wage rate the workers try to obtain and of the bargaining power of workers and of the market power of firms. We can identify from our model the rate of inflation and the real wage rate, that is to say, the distribution of the domestic revenue between workers and capitalists.

In the steady-state (or “equilibrium”) situation, we have:

$$\frac{\dot{w}}{w} = \frac{\dot{p}}{p} \quad (3)$$

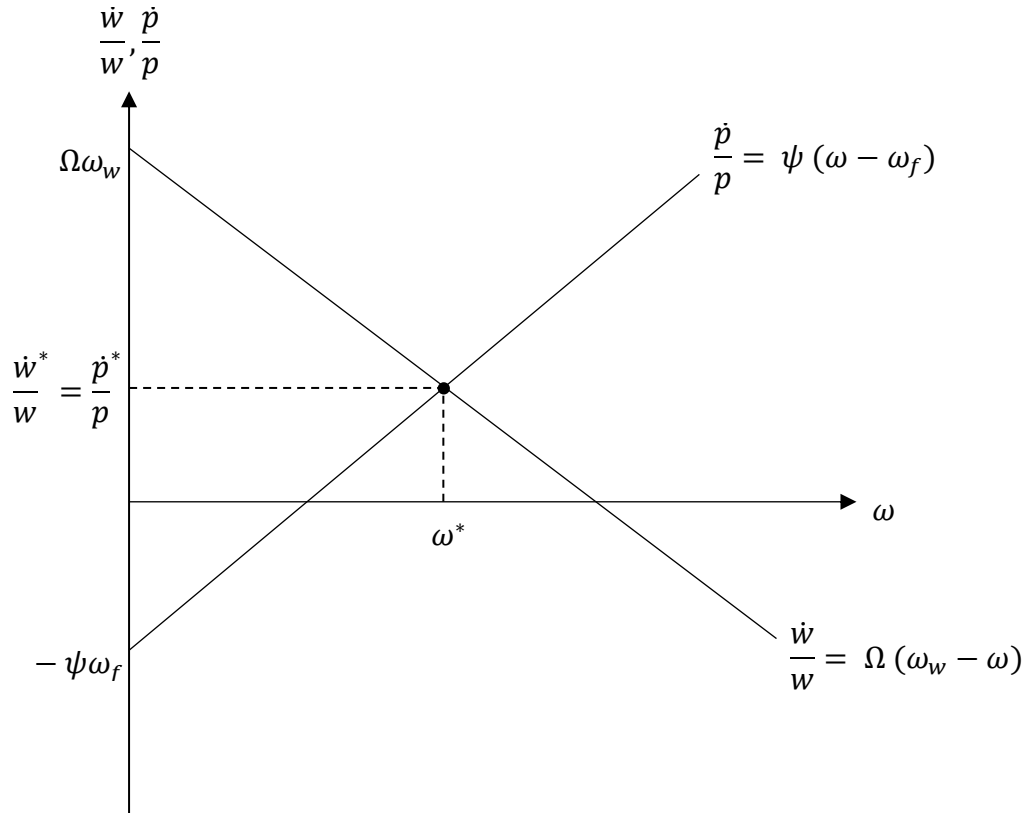
We can deduce the steady-state value of the real wage rate:

$$\omega^* = \frac{\Omega\omega_w + \psi\omega_f}{\psi + \Omega} \quad (4)$$

And the steady-state value of the price inflation:

$$\left(\frac{\dot{p}}{p}\right)^* = \frac{\psi\Omega(\omega_w - \omega_f)}{\psi + \Omega} \quad (5)$$

Graphical representation:



At this step, as underlined by Setterfield (2006), we should keep in mind three fundamental propositions: the conflict over the distribution of income is central to the process of inflation; both the bargaining power of workers and the market power of firms are incomplete; and workers and firms first bargain over the wage changes then, in a second round, firms set prices. Looking at equation (5), we immediately understand that the parameters determine the inflation rate and the distribution; any change in the values of the parameters will induce change in the inflation rate and in real wages. Although the rate of unemployment or the level of activity may influence wages or prices, it is important to highlight that the model is not designed to allow mechanical relations between these variables. In fact, one should recognize that exogenous elements (historical conditions, institutional context, etc.) strongly affect the values of the parameters.

What can modify the pace of inflation? Consequences of a decline in workers' bargaining power:

If workers' bargaining power declines (for example, due to a reduction in trade unions' strength stemming from labor market flexibilization and the increase in the number of short-term employment contracts), the slope of the line $\frac{\dot{w}}{w}$ is reduced. Therefore, the steady-state equilibrium changes: inflation is lower than before, and the wage rate declines. But institutional or legislative changes can affect bargaining power and market power too. Thus, Setterfield (2007, p. 142) explains how during the 1970s and 1980s in United States "a constellation of institutional changes [that] have diminished worker employment and income security independently of the performance of the aggregate labour market, as measured by the rate of unemployment." Aquanno and Brennan (2016, p. 235) made similar observations and came to similar conclusions about the Canadian economy. In the same vein, Vera (2017), on the U.S. economy of the second part of the twentieth century, concludes that the "discontinuity of the relationship between inflation and unemployment [...] is explained here to be guided by specific institutional arrangements associated with the distribution of market power between labor and capital". This means that the Post-Keynesian theory of inflation is not contradictory with the traditional Phillips curve, but wage increases are not only affected by the level of unemployment but also by "a large exogenous content in wage determination" (Atesoglu, 1997).

Consequences of an increase in input prices:

Of course, other cost variations than wage changes borne by firms can lead to increases in inflation and may be integrated in the reasoning. As previously noted, and as underlined by Lavoie (2014, p. 542), saying that “wages are the main determinant of prices does not necessarily imply that wage increases are the main cause of price inflation”. How can we deal in terms of our model with other causes of price inflation?

For instance, let’s imagine the economy is hit by a negative supply cost shock (such as an increase in imported commodity prices). Then, firms will try to pass-through this cost increase in domestic prices to maintain their profitability, meaning that real wages would decrease. Logically and as a consequence, workers would also react to this increase in inflation by claiming higher nominal wages.

Formally, we can introduce such an exogenous shock in our equations in the following way:

$$\frac{\dot{p}}{p} = \psi_1 (\omega - \omega_f) + \psi_2 Y \quad (6)$$

Where:

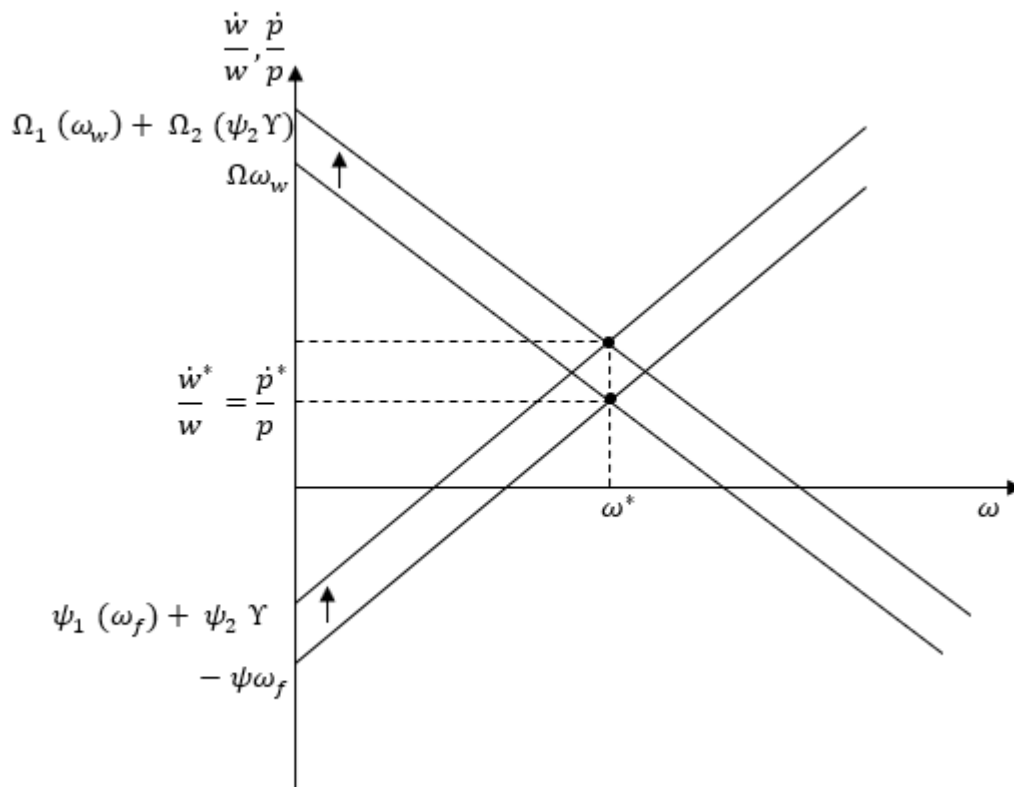
ψ_2 is the ability of firms to pass-through the exogenous increase in costs by an increase in domestic prices (with $0 \leq \psi_2 \leq 1$). Like ψ_1 , ψ_2 is a proxy of the market power of firms and is also positively related to the rate of capacity utilization (if firms operate with a low rate of capacity utilization when the shock arises, firms will have a smaller reaction than if the same shock arises when the rate of capacity utilization is high). Y is the exogenous shock, expressed as a growth rate of input costs.

And:

$$\frac{\dot{w}}{w} = \Omega_1 (\omega_w - \omega) + \Omega_2 (\psi_2 Y) \quad (7)$$

Where:

Ω_2 is the capacity of workers to pass-through the increase in inflation in nominal wages. Even if we observe a positive shock on input prices, it is still possible to imagine the real wage share does not change. If $\Omega_2 = \psi_2 = 1$, meaning that firms like workers manage to fully pass on the increase in costs to prices and nominal wages, the real wage share is the same as before, but inflation increases as depicted in the following figure:



This representation appears realistic: Bloch et al. (2004, p.543) find “complete pass-through of inflation in input prices to inflation in finished goods” for the U.S. economy in the twentieth century. So, if firms may be accustomed to passing-through an increase in costs to prices, during periods of high bargaining power of workers, we may observe examples in the real world where our assumption leading to both an increase in inflation and the stability of the wage share could be seen as acceptable.

But of course, such an exogenous supply shock usually causes an increase in inflation and changes in the distribution. Nevertheless, consequences are *a priori* undetermined. For example, if $\Omega_2 < 1$, meaning workers fail to fully adjust nominal wages after an increase

in inflation caused by an increase in costs incurred by firms, the wage share in the economy will decrease. Such a situation is described by Marie (2010) to explain the increase in inflation and the simultaneous decrease in the wage share in Argentina in 1974 as a result of firms' variable costs that were affected by the increase in the prices of imported goods involved in the production process. Lavoie (2014, p. 569) and Bastian and Setterfield (2020) also imply a fall in real wages after an exchange rate shock. This case may be regularly observed; Bloch et al. (2007) specifically study the effect of a commodity price boom in industrialized countries that use commodities as inputs: they find that the increase in commodity prices leads to increases in finished goods prices but the subsequent increase in wages is usually lower, particularly as “the experience of the past few decades indicates a strong tendency to implement deflationary policies” (op. cit., p. 38) that hampers the bargaining power of workers...

Inherent fragilities of the regime:

Describing the low inflation regime enables one to understand why economies in such a regime may face high unemployment. In wage-led economies, a rise in real wages is a prerequisite for a decrease in unemployment. But if the economic policy aims at fighting inflation, this condition may not be observed. In fact, nowadays, economies in a low inflation regime are prone to weak effective demand and to an income distribution inconsistent with full employment. Such a situation may even lead to risks of deflation, as was the case for example in the Eurozone at the beginning of the 2010s. We can also observe some general characteristics of economic policies in these regimes: they are mainly marked by tight monetary and fiscal policies. Fiscal policies are conducted based on “sound finance principles”, whereas the central bank opts for a tight monetary policy, meaning high interest rates. In fact, economic policies aim at lowering the inflation rate and, monetary policy is the core macroeconomic tool. Opting for tight monetary and fiscal policies as a means to keep inflation rates low causes low economic growth rates and high unemployment levels. The Eurozone economy may be the best example of such a strategy. As most economies are nowadays under a low inflation regime, there are economic policy possibilities to reach full employment and to foster investment: in such a low inflation regime, there is room to adopt true and active “Keynesian economic

policies” based on fiscal expansion. In the current context, such public intervention would not generate inflation in the short run because bargaining power, market power, the real wage targeted by workers and the mark-up targeted by firms are low; these parameters would have to be reinforced before a wage-prices spiral could arise.

The road towards the moderate inflation regime

History tells us that the current situation – wherein our core parameters are at low values – is not always the case: a low inflation regime with high values of the key parameters can switch to a moderate inflation regime. In this context, a first point to mention is that, even if workers manage to react and to obtain an increase in nominal wages after an increase in inflation induced by an exogenous shock, the adjustment process of the nominal wages after an increase in prices is not instantaneous. In fact, firms usually react sooner than wage earners (see for example Bloch and Sapsword, 1991). Firms may rapidly react to an increase in their costs whereas wage earners will react only after they observe that domestic prices have increased. During the adjustment process, and due to the lag of these reactions, the real wage has temporally decreased. As Vera (2013, p. 261) suggests: “As inflation erodes real values and misaligns relative prices, agents are required to reset wages and renegotiate contracts by creating rules that reconstitute the claims of peak real incomes periodically. When inflation rises to two- or three- digit levels, market transactions and contracts become disrupted, and it may happen that contracts start to index wages to inflation.”

Thus, these observations are important, and open the door to a modification of the inflation regime; the development of indexation of wages on inflation is the hallmark of this new regime.

3 The Moderate Inflation Regime

The moderate inflation regime emerges when inflation is relatively high in the low inflation regime, due to the virulence of the distributive conflict. A supply shock can induce the move from the low inflation regime to the moderate inflation regime (as with the oil shocks in the 1970s for many developed economies). In this regime, there is a growing institutionalization of the indexation of wages on prices. The distributive conflict still plays an important role in the inflation path, and inertia of inflation is also growing.

Main Characteristics:

In a moderate inflation regime, due to experience, agents adapt their behavior and seek to develop new institutions designed to prevent abrupt changes in income distribution due to the instability of inflation. The best example of such a regime shift is certainly the emergence of indexation mechanisms in the context of the so-called developed economies in the late 1960s. At that time, an upward trend of inflation had been observed for several years caused by both the strengthening of bargaining power and increases in targets due to strong economic growth, and a concomitant instability of inflation due to different exogenous and supply shocks. In that sense, anticipations are backward looking (see for example Nevile and Krielsner, 2008, p. 314), explaining the development of indexation. It is beyond the scope of this paper to define a *universal* inflation rate threshold at which agents start to index insofar as we want to stress qualitative characteristics to define our different regimes. In any case, a typical moderate inflation regime usually develops when the inflation rate moves beyond two-digits or some level close to this mark. Moreover, there are two factors that may influence this threshold. The first is trade union bargaining power: the stronger trade unions are, then the faster they can impose indexation. The second is the country's previous experience of high inflation: countries with experience of a high inflation regime develop a sort of *inflation memory*, meaning that they are likely to index faster than countries without such experience. Furthermore, it is important to observe that an economy will not necessarily move immediately to a moderate inflation regime if the inflation rate exceeds a specific threshold. As previously noted, inflation

rates need to remain in this pattern for some time for agents to adapt. In other words, inflation rates need to be systematically high.¹²

In turn, as indexation of wages spreads,¹³ a new inflation regime appears; this “new ‘order’ [...] represents a sustainable adaptation to the (inflationary) environment. [...] Indexation is not a solution to distributive conflict but a new form for its institutionalisation” (Carvalho, 1993, p. 66). As explained by Bastian and Setterfield (2015, p. 654) “thanks to indexation, shocks that increase inflation propagate into permanent increases in the equilibrium rate of inflation.” This analysis is fully in line with the structuralist analysis of inflation; as stated by Taylor (2004, p. 70), “[c]onflict and propagation mechanisms are the essential elements of structuralist inflation theory”. In the 1980s, neo-structuralists authors proposed models of inertial inflation based on two central hypotheses (Serrano, 2010):¹⁴ the real markup is exogenous, and workers obtain the nominal wage targeted, but do not try to increase their average real wage. Here, we do not assume the income distribution cannot change and that workers always lose in the process: in case workers’ bargaining power is strong (or reinforced after capitalists increase their prices), we admit that they can possibly increase their real wages. In other words, in our approach, the market power of firms, the bargaining power of workers, and the real wage targets may change, both in the moderate inflation regime as well as in the low inflation regime.

In the so-called moderate inflation regime, the distributive conflict still plays a fundamental role in inflation. But the indexation of wages on past inflation, as an

¹² The transition from a *low inflation regime* to a *high inflation regime* can be smooth or violent. Here we consider a smooth transition. Bastian and Setterfield (2015) analyze the case of a violent transition.

¹³ There can be different types of indexation mechanisms in the economy in a moderate inflation regime. The distinctive element of a moderate inflation regime is that indexation is restricted to just a few contracts and sectors.

¹⁴ Serrano (2010) refers to a research group at the Department of Economics of the Pontifical University of Rio de Janeiro (PUC/RJ), which in the early 1980s developed interesting work on the inertial characteristics of Brazil’s inflation. This group was usually called neo-structuralist. There is no consensual definition of neo-structuralism and there are economists from other departments and countries who have also been referred to as neo-structuralists.

institutional creation, induces an inertial component to inflation. Following Ros (1989, p. 10), “inflation rises by stages and stabilizes around them until a new shock induces an acceleration towards a higher but stable ‘plateau’.” Indexation breeds a feeling of safety for all agents. Thanks to indexation, the uncertainty over the outcome of negotiations about the level of wages between workers and capitalists is reduced: indexation “may, in principle, be conceived to reorient the opposing forces not towards a kind of final settlement, which is not achievable, but to compliance with rules of conflict that limit damages and increase the predictability of outcomes, allowing economic life to recover some measure of stability while conflict goes on. This, as we shall see, is the real meaning of indexation” (Carvalho, 1993, p. 66). Hence, indexation is likely to emerge in situations where bargaining power is relatively strong.

The term “regime” is adapted to describe situations in which indexation prevails. The institutional adaptation allows higher rates of inflation to be durable and may not induce an economic collapse. In case of exogenous shocks, the rhythm of inflation would be affected, as if we observe modifications in the terms of the distributive conflict in a similar way to situations we addressed in the previous section.

Moderate inflation regimes are not rare in real world experience. Firstly, even in situations where indexation is not generalized to all contracts, it is not unusual for some wage earners to benefit from some indexation clauses. Moreover, full indexation (or quasi-full indexation) of wages on prices was the norm during the late 1970s in industrialized countries, “although the adaptation process can take different forms and [is] influenced by particular historical circumstances” (Ros, 1989, p. 9). For example, a full wage indexation on prices was decided by the Australian government in April 1975 (see Phipps, 1981, or Warren, 1980). In the case of France, the minimum wage was indexed just after World War II, but the full indexation of wages was generalized in a period of strong bargaining power of workers, after the huge demonstrations and strikes during May 1968. Thus, “the quasi-indexation of wages with consumer prices, which can be observed from 1969 onwards, continued during the crisis. The fall in the exchange rate reinforced domestic inflationary tendencies and caused the acceleration in wages during 1974” (Boyer, 1979, p. 117). In Israel, from the 1950s to 1975, wages were indexed to a *Cost of Living Adjustment Index* that differed from the Consumer Price Index; “the general

pattern is one of reasonable protection [of the purchasing power of workers] during the 1950s and 1960s, and relatively greater erosion during the accelerating inflation in the 1970s” (Prager, 1986, p. 266). Thus, in a moderate inflation regime, a crucial issue is to define the index on which one bases indexation (Jany-Catrice, 2020). In many industrialized countries, indexation mechanisms were dismantled during the 1980s; nowadays their economies evolve under a low inflation regime, generally marked by low bargaining power of workers and market power of firms, explaining the low inflation rates observed.

The recent economic history of Latin American countries provides some typical examples of experiences of moderate inflation regimes. Since the 1960s several authors, following a path first taken by Pazos (1963) and Simonsen (1970), have identified indexation as generating inertia in inflation.

Following Bastian and Setterfield (2015), we can encompass our observations to define the moderate inflation regime and thus to formalize the moderate inflation regime.¹⁵ The rate of change of nominal wages is similar to the rate of change presented in (1), but an indexation component is added:

$$\frac{\dot{w}}{w} = \Omega (\omega_w - \omega) + \lambda \left(\frac{\dot{p}}{p}\right)_{-1} \quad (8)$$

Here the subscript (-1) indicates that workers aim to index nominal wages on past inflation. The parameter λ indicates the degree of indexation obtained by workers. If $\lambda = 0$, there is no indexation of wages on prices. If $\lambda = 1$, there is a full indexation of wages on inflation observed in the previous period. All potential values of λ between 0 and 1 describe situations where full indexation of wages is not observed. The rate of changes of prices can be formally expressed in the following manner, where β indicates the degree of indexation of prices in reaction to wage indexation:

¹⁵ The equations that here describe the moderate inflation regime are the equations that describe the high inflation regime in Bastian and Setterfield (2015).

$$\frac{\dot{p}}{p} = \psi (\omega - \omega_f) + \beta \left(\frac{\dot{w}}{w}\right) \quad (9)$$

Steady-state equilibrium conditions:

$$\frac{\dot{w}}{w} = \frac{\dot{p}}{p} = \left(\frac{\dot{p}}{p}\right)^{-1}$$

$$0 \leq \lambda = \beta \leq 1$$

Steady-state values:

$$\omega^* = \frac{(1 - \beta)\Omega\omega_w + (1 - \lambda)\psi\omega_f}{(1 - \lambda)\psi + (1 - \beta)\Omega}$$

$$\left(\frac{\dot{p}}{p}\right)^* = \frac{\psi\Omega (\omega_w - \psi\omega_f)}{(1 - \lambda)\psi + (1 - \beta)\Omega}$$

Here, if $\lambda = \beta$, *ceteris paribus*, we observe the inflation is higher than the inflation observed in the low inflation regime.¹⁶

Even if moderate inflation regimes can be regularly observed and even if such regimes may endure over time, they suffer from fragilities that may lead to a modification of the regime towards the high inflation regime.

¹⁶ It is possible, for a short period of time, that inflation rates in a moderate inflation regime become low without the economy moving back to a low inflation regime. This can happen after some positive shocks (or maybe productivity gains) that help inflation rates to fall. However, a regime shift necessarily means institutional change. Hence, moving from a moderate back to a low inflation regime means dismantling the indexation clauses that characterize the moderate inflation regime. In fact, without dismantling these indexation rules, inflation is unlikely to remain low. In other words, the fall in inflation rates tend to be temporary (see for example Phipps, 1981). In fact, during some historical episodes, the development of indexation of wages played an unexpected role: the indexation went hand-in-hand with a decrease in real wage targets and with an erosion of the bargaining power of workers (see Warren, 1980). As unions obtained the full indexation, it was then more difficult for workers to negotiate for more.

Inherent fragilities of the regime:

In practice, the main fragility of the moderate inflation regime comes from the capacity of this regime to generate inflation inertia. Each shock can induce an increase in inflation as in the low inflation regime, but the new levels of inflation are perpetuated with indexation. Here, external constraints may play an important role as underlined by structuralist authors: when an exchange rate adjustment occurs (for example to restore external equilibrium), unit costs rise and because of indexation, these unit cost rises lead to domestic price increases and ultimately to rises in nominal wages (see for example López Gallardo and Mansilla, 2007, p. 85). In a nutshell, each shock may perpetually raise inflation to higher levels. This observation explains why Latin American economies – with recurrent problems of balance of payments and with indexation schemes – are prone to experience high inflation rates.

If institutional indexation mechanisms were efficient, it would be easy to conclude that increases in inflation do not cause changes in distribution; meaning that in countries where income distribution is very unequal, a perfect indexation scheme that freezes income distribution could not be considered as a solution. In the real world, indexation schemes tend to be imperfect, meaning that there are indeed risks of changes in distribution. One must also bear in mind that indexation of wages is usually organized at discrete times (Jadresic, 2002). This observation opens the way to a change of regime.

The way towards a high inflation regime:

Pazos (1963; 1972) was probably the first to analyze inflation dynamics when indexation mechanisms play an important role. His reasoning was further developed by different authors like Simonsen (1970) or Frenkel (1979). Pazos's analysis starts with the observation that the readjustments of nominal wages (secured by indexation) occur at pre-determined dates. Consequently, as prices of goods tend to be adjusted in more continuous times, real wages are immediately affected by inflation, thus encouraging workers to obtain an increase in the frequency of their nominal wage readjustments. Then, it is observed that shortening the indexation intervals and increasing the frequency of adjustments of wages increase inflation (see also Taylor, 2004, p. 74). The consequences

of this mechanism are also described by Vera (2013, p. 261): “There are situations, however, in which higher inflation in the past leads to higher wage settlements which in turn further raise inflation. [...] Thus, as inflation accelerates, contracts shorten, and that shortening of contracts is itself a factor that causes inflation to accelerate.” Beyond the quantitative level of inflation levels mentioned by Taylor, we have to mobilize, in order to build our typology, the teachings of the so-called “Pazos-Simonsen” theorem: in a moderate inflation regime, inflation may increase as a result of shortening the time span between two wage revisions, thus leading to new increases in inflation and new claims for increased frequencies of reevaluation of nominal wages. In other words, in cases of repeated shocks, the inflation rates observed in a moderate inflation regime may increase strongly.

As a consequence, when the frequency of adjustments of nominal wages increases and inflation rises, wage indexation may become insufficient. Agents react to the risks of new increases in inflation by refusing contracts without indexation (for example, in the case of real estate renting or for savings denominated in domestic currency) because uncertainty about inflation could minimize the potential benefits of the transaction. Then, new institutional arrangements develop in the economy, meaning that it moves from the *moderate inflation regime* to the *high inflation regime*.

4 The high inflation regime

In the high inflation regime, further changes take place: indexation of wages on prices is generalized, and we now observe a spread of other indexation mechanisms. Following Carvalho (1993, p. 67), “the main feature of a high inflation regime is the creation of a widespread system of contracts denominated in a unit of account other than the legal tender of the economy”. Here, we generally observe the reduction in the duration of many contracts. Franco (1990) suggests that there is a qualitative change that starts when wage readjustments become monthly.¹⁷ In fact, problems really start when monthly readjustment are not enough, so that workers either try to get real wages that are higher than the previous peak real wage – to sustain their average real wage – or try to get quarterly or even weekly readjustments. High inflation regimes can last for several periods, several years. This possibility allows us to use the term “regime”. Nevertheless, we need to keep in mind that such a regime is unstable; as explained by Carvalho (1993, p. 70) a high inflation regime is an “unstable arrangement, in which inflation is always more likely to accelerate than not. Any exogenous inflationary shock is perpetuated since all agents are potentially capable of shifting it into the prices they charge for their own goods or services.”¹⁸

We have also to note that this regime requires the availability of a continuously published index: Carvalho (1992) makes a similar point. Accordingly, he argues that “shorter adjustment periods demand other kinds of indices than price indices. In most cases the new adjustment index has been the exchange rate to the dollar” (Carvalho, 1992, p. 201). Thus, in a high inflation regime, we may observe the development of indexation on

¹⁷ Franco (1990) suggests that this usually happens when monthly inflation rates move beyond 20 percent (Franco, 1990, p. 65).

¹⁸ In a moderate inflation regime, inflation shocks also tend to have lasting effects. However, due to widespread indexation, the effects of such shocks tend to have permanent effects: after a shock, inflation rates move to a new *plateau* and are unlikely to return to the former *plateau*. Moreover, inflation shocks play an important role when it comes to shifts from one regime to another. For instance, it is fair to argue that Western European countries moved from a low inflation regime to a moderate inflation regime after the First Oil Shock, whereas some Latin American countries moved from a moderate inflation regime to a high inflation regime after the same shock.

exchange rates (“since no domestic price index is available on weekly or daily basis, quotations of the exchange rate become the central pillar for calculating prices”, Vera, 2013, p. 266). Such a characteristic is decisive in a potential path to hyperinflation.

Main characteristics:

In the high inflation regime, wages are still index-linked to domestic prices, and of course the role played by the traditional distributive conflict still prevails. But in this regime indexation mechanisms tend to be generalized within the economy: we observe a generalization of indexation on all labor contracts and other contracts as well. Indexation spreading can be informal or imposed by the government.¹⁹

The widespread indexation within the economy opens new issues. The main difficulty is the definition of an index that is widely accepted. Here, the stakes on the definition and estimation of the index are crucial. Moreover, it is technically difficult to produce an index that is published daily, in order to cover all the maturities of contracts (from the shorter to the longer); the Chilean experience with the “*Unidad de Fomento*” – explicitly adopted by the Chilean authorities in the 1980s – and the Brazilian *ORTN* – which was the main index of reference for agents from the mid-1960s to the mid-1980s²⁰ – may be exceptions. Due to these difficulties, agents within an economy under a high inflation regime often adopt the exchange rate as the main reference to adjust prices, wages, and all other types of contracts (Simonsen, 1995, p. 1); that is a hallmark of the first step

¹⁹ As Franco observes, “when payments start to be reckoned in terms of the index, and no longer in terms of the standard monetary unit, what takes place is nothing else than indexation in its informal sense” (Franco, 1986, p. 233). However, as agents try to “contract in a money of account that is convenient to them”, there can be a “proliferation of monies of account”, with the result that “the excessive degree of uncertainty that such a system would create leads the state to impose a restricted set of indices that agents need to accept in their private contracts” (Carvalho, 1992, p. 194).

²⁰ *ORTN* (*Obrigações Reajustáveis do Tesouro Nacional*) were a public bond whose nominal value was periodically readjusted based on official inflation rates, thus guaranteeing real revenues for its buyers. As Simonsen (1995) explains, although it was not the intention of the policymakers who created it in 1964 in a context of high inflation rates and a tiny public bonds market, *ORTN* soon became an indexed unit of account and thus a reference for several contracts (Simonsen, 1995, p. 33).

towards a spontaneous dollarization of the economy. Two different explanations can be expounded as regards dollarization. Firstly, the exchange rate is published on a daily basis making it easy for agents to use the exchange rate as an index. Secondly, due to the instability of inflation, it becomes increasingly hazardous for savers to hold assets denominated in the domestic currency, so they look to hold assets indexed on exchange rate variations or directly denominated in a foreign currency. Thereby, we understand the high inflation regime characterization proposed by Carvalho (1993, p. 67): “[t]he main feature of a high inflation regime is the creation of a widespread system of contracts denominated in a unit of account other than the legal tender of the economy.” Likewise, Franco (1986, p. 233) argues that “it is commonly observed that high inflation destroys the store of value function of money, but it is less often observed that the unit of account function is also weakened, as the monetary unit becomes inappropriate for reckoning real values”.

Formally and following what we stated, as under a high inflation regime, workers like firms aim at indexing both nominal wages and prices on both past inflation (or nominal wage increases) and on the exchange rate.

The γ and σ parameters are different than zero, positive and can vary up to one; we admit the possibility of full or partial indexation on the exchange rate. The ratio $\frac{\dot{e}}{e}$ is usually the rate of growth of the exchange rate, but in certain cases it may be the rate of growth of a specific index accepted by the agents (as the *unidad de fomento* in the Chilean case).

$$\frac{\dot{w}}{w} = \Omega (\omega_w - \omega) + \lambda \left(\frac{\dot{p}}{p}\right)_{-1} + \gamma \frac{\dot{e}}{e} \quad (10)$$

$$\frac{\dot{p}}{p} = \varphi (\omega - \omega_f) + \beta \left(\frac{\dot{w}}{w}\right) + \sigma \frac{\dot{e}}{e} \quad (11)$$

Steady-state equilibrium conditions:

$$0 \leq \lambda = \beta \leq 1$$

$$0 \leq \gamma = \sigma \leq 1$$

Inherent fragilities of the high inflation regime:

If we do not observe the steady-state equilibrium conditions in a high inflation economy, any shock will induce major changes in distribution and in inflation. In this regime, a depreciation of the domestic currency will immediately feed inflation by increasing firms' costs but also by directly affecting all the contracts denominated in foreign currency or indexed on the exchange rate. This characteristic reinforces the pressure put on the central bank to keep the exchange rate stable; as a consequence, the entire economic policy should be mobilized towards this goal (achieving the foreign stability of the domestic currency).

Regarding this process (of dollarization of an economy), it is worth noting that it can be encouraged by measures taken by domestic authorities. An example is the adoption of “*Tablitas Cambiarias*” in Chile or in Argentina in the late 1970s – simultaneously to the liberalization of international capital flows – which encouraged dollarization because the main characteristic of these exchange rate systems was the pre-announcement of the targets of the nominal exchange rate of the domestic currencies on the dollar. In a way, these preannouncements greatly lowered the exchange-rate risk taken by agents (as long as they believed in the announcements) and encouraged them to count in dollars. In Argentina, in the late 1970s, this system strongly encouraged indebtedness in dollars by private agents with U.S. financial institutions thus spreading the use of the dollar as store of value. Israeli economic history provides another example: at the end of 1977, the Israeli Central Bank allowed banks to offer accounts whose deposits in domestic currency were indexed to the exchange rate between the domestic currency and the U.S. dollar (see Charles and Marie, 2021). As a result, the dollar was used as store of value, also becoming the unit of account. In these two last cases, the economies evolved – around the beginning of the 1980s – into high inflation regimes.

In sum, the examples above show that economic authorities can reinforce the dollarization of the economy, resulting in a shift of the inflation regime that makes it increasingly harder to reduce inflation. Moreover, the importance of the variation of the exchange rate in defining a high inflation regime is consistent with the observation made by Robinson (1951) in her analysis of German hyperinflation in the early 1920s: “each rise in wages, therefore, precipitated a further fall in the exchange rate, and each fall in the exchange

rate called forth a further rise in wages.” It also corroborates the remark by Kaldor (1982) about the German situation in 1923: if foreign exchange remains stable during the day, prices and wages do too. This is also consistent with the analysis of the inflation observed in Bulgaria during the 1990s (Charles and Marie, 2020).

5 Hyperinflation

Our observations finally enable us to define hyperinflation. We cannot label hyperinflation episodes as a specific regime because hyperinflation is a short-term phenomenon. Hyperinflation is invariably indicative of the rejection of the domestic currency.²¹ Liquidity preference, self-fulfilling expectations, and structural macroeconomic vulnerabilities of the economy (such as a balance of payments disequilibrium and acute distributive conflict) are key to understanding the emergence of these episodes.

Cases of hyperinflation in economic history are relatively rare. Hanke and Krus (2012), adopting the quantitative definition of hyperinflation proposed by Cagan (1956),²² count 56 cases in history. Clusters of episodes are observed in the 1920s, the 1940s, the 1980s and the early 1990s. Adopting the same criterion to define hyperinflation as Hanke and Krus, Saboin-Garcia (2018), among others, adds to the previous instances of hyperinflation the contemporary case of Venezuela. Although hyperinflation is rare, the fear of it is still present in people's minds and can be used by economists or policy makers to justify economic policies based on "sound finance" and on restrictive monetary policy. As for example, Reinhart and Savastano (2003, p. 22) estimate that "Major fiscal adjustments have been needed to end all modern hyperinflations". They also face the fact that "[d]espite falling inflation rates worldwide, hyperinflation could happen again".

It is important to highlight that hyperinflation surged in a context of instability of the international monetary system: after the crisis of 1929 and before the establishment of the Bretton-Woods system or after its dismantlement. Bastos (2002, pp. 48-49) explains that the common element between countries that experienced hyperinflation during the 1920s

²¹ Kalecki (1962) proposes a definition of hyperinflation in a closed economy; here the rejection of the currency is also a key feature as it is observed a "general tendency to convert money into goods". In an open economy and in our International Monetary System, the rejection of a domestic currency is marked by the tendency to convert the domestic currency units into a foreign currency.

²² Cagan (1956, p. 25) gives the following definition of hyperinflation: "as beginning in the month the rise in prices exceeds 50 per cent and as ending in the month before the monthly rise in prices drops below that amount and stays below for at least a year."

and the 1980s was a break in financial capital inflows. Moreover, there was indeed no case of hyperinflation during the period of the Bretton-Woods system, a period of broadly stable exchange rates. Hence, we should focus on the links between domestic prices and exchange rates or, in other words, on relations between external economic instability and domestic economic dynamics.

Main characteristics:

Hyperinflation arises from a high inflation regime and reveals the rejection of the domestic currency. In an open economy, agents substitute the domestic currency for a foreign currency.

Adopting this qualitative criterion permits us to clearly distinguish between high inflation periods and hyperinflation. Adopting a Keynesian perspective, it also provides solid arguments for the need to avoid hyperinflation: as the domestic currency is destroyed during hyperinflation, domestic authorities lose their capacity to establish an autonomous monetary policy. Moreover, hyperinflation episodes “go hand-in-hand with situations of shortages in the supply of goods, impoverishment of rentiers, and reductions in real wages, which, although they may benefit from inflation-indexing mechanisms, are penalized by the existence of adjustment lags. This means that only the profits of entrepreneurs, and above all those made by big business, thrive” (Charles and Marie, 2021, p. 533).

As previously noted, the change from one specific inflation regime to another is strongly connected with institutional changes. In this context, “the passage to a hyperinflation can occur, in modern conditions, if excessive pressure is put on the institutions that define high inflation” (Carvalho, 1992, p. 200). In sum, as inflation accelerates, anticipations become increasingly important in the determination of wages and prices.

As observed in the previous section, the main issue is that around a specific point agents stop indexing on past inflation and start to base their claims on expectations (Franco, 1990, p. 65), specifically when they expect a strong external depreciation of the domestic currency (Charles and Marie, 2016). In other words, there is a “break in the connection

between readjustments and the inflation index representing past inflation, resulting in a new connection between readjustments and future inflation or expectations regarding future inflation. Wage readjustments lose their former *anchor* and start to fluctuate based on anticipations, which are informed by quotations of speculative markets on a daily-basis” (Franco, 1990, pp. 65-6). In the classical hyperinflation cases, we observed that agents usually took the exchange rate market as the reference for future inflation (Franco, 1990, p. 66).

Hyperinflation episodes, as important monetary crises, are inextricably linked with political crises as they reveal the loss of confidence in the currency. They are also usually marked by the contestation of the authorities and political institutions (Théret, 2007). Thus, we understand some instances of hyperinflation are due, among others causes, to political events such as geopolitical divisions or the reorganization of states, as for example in Europe after WWI with the Successor States of the Austro-Hungarian Empire in the 1920s (see Bastos, 2002 or Desmedt 2021) or after the dismantlement of the socialist block in the early 1990s (see for example Charles and Marie, 2017, on Bulgaria’s hyperinflation of 1997). Other political events such as acute political instability, civil wars, or *coups d’état* may also encourage hyperinflation.

Nevertheless, hyperinflation is rooted in high inflation regimes, and they always experience a surge in the presence of certain macroeconomic characteristics. Firstly, it should be recalled that agents exhibit a preference for liquidity: agents wish to hold a highly liquid asset whose value is stable. But if the domestic currency fails to offer these conditions (because of a continuous depreciation in its value or because of anticipations of depreciation in its value), agents will look for substitutes. Davidson ([1982] 1992) and Dow (1999, pp. 154-5) explain this mechanism: “the national currency is generally the asset which is most liquid and most stable in value. But within the international economy, there is a range of moneys. As long as each has a stable value in relation to the others, then the most liquid of these is generally employed as a means of payment and unit of account; this would normally be the national currency of the economy concerned. But, where the domestic value of the national currency is falling significantly relative to foreign currencies, because of domestic inflation or a depreciating exchange rate, other currencies may better satisfy liquidity preference. In cases of hyperinflation, capital

controls may not be sufficient to prevent demonetization and the substitution of foreign currency for domestic currency.” We thus understand that demonetization of the economy (huge fall in the money stock as a share of GDP) is a crucial aspect of hyperinflation episodes. This observation was previously made by Franco (1990), Orléan (2007), and Drabo (2019).

A second aspect seems crucial in hyperinflation: the preexistence of external fragilities, especially the vulnerability of the economy regarding its balance of payments. A negative balance registered in the balance of payments may make it impossible for a central bank to avoid a strong devaluation of domestic currency. Such external imbalances tend to be fed by high levels of inflation but, of course, a reversal of the conditions for capital inflows may also be a key event in triggering hyperinflation. In sum, as inflation accelerates in a high inflation regime, anticipations become increasingly important in determining wages and prices. As a result, the inflation rate and relative prices become more volatile, inducing agents to try *realignments* that further accelerate the inflation rate.²³ Moreover, the growing importance of the nominal exchange rate as a reference induces agents to demand dollars as a store of value, so that the greater demand for dollars devalues the nominal exchange rate, thereby further accelerating inflation rates. In this sense, Bastos (2002), Marie (2014) or Charles and Marie (2016) noted for instance that hyperinflation episodes usually occur in countries with high levels of foreign debt. This is not surprising: the need to pay external debt interest induces policymakers to promote exchange rate devaluations towards generating trade surpluses. As previously noted, these devaluations feed inflation rates and agents’ defensive behavior towards sustaining their real income. This mechanism was important for example in the German hyperinflation of the 1920s – as observed by Joan Robinson – and in the Latin American high and hyperinflation episodes of the 1980s.

Finally, the surge of hyperinflation, as a rejection of the domestic currency, is triggered by a violent change in behavior, fed at least partially by the macroeconomic context. In that sense, hyperinflation is not induced by non-rational compartments. The surge in

²³ Peak real wages tend to increase over time, although average real wages keep falling (Franco, 1990, p. 66).

hyperinflation is finally caused by a massive and self-fulfilling movement towards the foreign currency: a run on the foreign reserves arises and the exchange rate as the domestic prices expressed in domestic currency explode.²⁴ This brief and violent episode highlights the difference of nature between inflation and hyperinflation.

Formally, as we call attention to the specific importance of anticipations on the exchange rate in the spurt of hyperinflation, and as we observe that during episodes of hyperinflation all the previous institutional schemes observed in our different inflation regimes have collapsed, we may propose the following formalization of hyperinflation:

$$\frac{\dot{w}}{w} = f[E(\dot{e}_{t+1})] \quad (12)$$

$$\frac{\dot{p}}{p} = f[E(\dot{e}_{t+1})] \quad (13)$$

Here, we propose that increases in nominal wages like price increases during hyperinflation are caused by expectations about exchange rates. In reality, and as in the high inflation regime, prices are adjusted more often than wages, explaining that during hyperinflation real wages crumble.

Nevertheless, this formalization should not divert us from our purpose: hyperinflation can be regarded as the last episode of a causal sequence first built on the driving role played by the distribution conflict in inflation, then the importance of indexation, and finally the importance of the foreign exchange rate for domestic behavior. In other words, “We can take away from these considerations that, in the absence of any external debt in foreign currency, in the absence of price and wage-indexing mechanisms, and in the absence of any distribution conflict, the terms of which may trigger high inflation, there is no cause

²⁴ It is worth noting that in specific contexts there are self-fulfilling movements of price rises – due to anticipations – that do not lead to hyperinflation. This is, for example, the case of countries under high inflation rates and with some previous experience of stabilization plans based on wage and price freezes. In these countries, for example if a new Finance Minister comes into office, businessmen may anticipate that there will soon be a new price freeze. Hence, they start increasing their prices before the price freeze takes place thus accelerating inflation. The stabilization plan then halts inflation acceleration, at least in the short run. These movements were for instance a common place in Brazil in the late 1980s, after a stabilization plan based on wage and price freezes – the Cruzado Plan – failed in 1986.

to fear the emergence of a hyperinflationary phenomenon” (Charles and Marie, 2021, p. 534).

6 Concluding remarks

This paper seeks to present a synthetic, pedagogical and consistent Post-Keynesian/structuralist view of inflation and hyperinflation, on the basis of which we develop a typology of inflation regimes. Considerable attention is paid to the importance of institutions, and the cost-push nature of inflation and the endogenous nature of money are acknowledged. Furthermore, our reflection is based at the same time on path-breaking contributions from the past and also on recent Post-Keynesian/structuralist analyses of inflation regimes and dynamics.

We propose essentially qualitative definitions for three different inflation regimes: low, moderate, and high. In addition to these three regimes, we also analyze the dynamics of hyperinflation episodes, which cannot be labelled as regimes because they are short-term phenomena. In this sense, we provide a typology of regimes that deals with all different situations regarding inflation. Hence, the paper marks an advance in relation to existing contributions, which tend to analyze only low and high inflation regimes plus hyperinflation episodes. Moreover, we supplement our qualitative analysis with equations and a graphical representation describing inflation dynamics in the different regimes and also in hyperinflation episodes. We observe that moves from one inflation regime to another are often induced by exogenous factors (change in commodity prices, jump in the exchange rate, capital outflows, etc.). We also suggest that due to ratchet effects and to the persistence of institutional mechanisms, it is difficult to move back from hyperinflation to the high inflation regime, from the high to the moderate inflation regime, and from the moderate to the low inflation regime.

Further work and specific case studies should be carried out to improve our understanding of the historical paths taken by different economies when switching regimes. In any case, our typology shows that regime shifts always require a process of institutional change, which is neither trivial nor rapid. Hence, the current *fear of inflation* that some analysts have been exhibiting – in the context of fiscal programs for economic recovery after the pandemic – is an overreaction. Moreover, we notice that changes in inflation regimes are generally not brought about by expansionary policies but by exogenous shocks in a context of rising inflation. As most countries live today in a context of low inflation – characterized by unemployment and by low levels of capacity utilization – expansionary

policies will not be highly inflationary in the short-run. We can add that firms invest in response to fiscal stimuli and an increase in effective demand in order to increase their productive capacity and not to exceed a normal level of capacity utilization. Such observations reinforce the need for industrial policies and more generally for policies designed to limit the exposure of the economy to external shocks.

References

Aquanno, S. and Brennan, J. (2016) “Some Inflationary Aspects of Distributive Conflict: Reassessing Canadian Inflation, Part I”, *Journal of Economic Issues*, vol.50/1, pp.217-244.

Atesoglu S. (1997) “A Post Keynesian explanation of U.S. inflation”, *Journal of Post Keynesian Economics*, vol.19/4, pp.639-649.

Bastian, E. and Setterfield, M. (2015) “A simple analytical model of the adverse real effects of inflation”, *Journal of Post Keynesian Economics*, vol.38/4, pp.637-665.

Bastian, E. and Setterfield, M. (2020) “Nominal exchange rate shocks and inflation in an open economy: towards a structuralist inflation targeting agenda”, *Cambridge Journal of Economics*, vol.44/6, pp.1271-99, doi:10.1093/cje/beaa008

Bastos, C. P. (2002) *Price stabilization in Brazil: a classical interpretation for an indexed nominal interest rate economy*, PhD Thesis, New School for Social Research.

Bivens, J. (2021) “Inflation - sources, consequences, and appropriate policy remedies”, *Working Economics Blog*, Economic Policy Institute, June, <https://www.epi.org/blog/inflation-sources-consequences-and-appropriate-policy-remedies/>

Bloch, H. and Sapsword, D. (1991) “Postwar movements in prices of primary products and manufactured goods”, *Journal of Post Keynesian Economics*, vol.14/2, pp.249-266.

Bloch, H., Dockery, M., Morgan, C. and Sapsword, D. (2007) “Growth, commodity prices, inflation and the distribution of income”, *Metroeconomica*, vol.58/1, pp.3-44.

Bloch, H., Dockery, M., and Sapsword, D. (2004) “Commodity prices, wages, and U.S. inflation in the twentieth century”, *Journal of Post Keynesian Economics*, vol.26/3, pp.523-45.

Boyer, R. (1979) “Wage formation in historical perspective: the French experience”, *Cambridge Journal of Economics*, vol. 3, pp. 99-118.

Boyer, R. (2004) *Théorie de la régulation, 1. Les fondamentaux*. Paris: La découverte.

Cagan, P. (1956) “The Monetary Dynamics of Hyperinflation” In M. Friedman (ed.), *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press, pp.25–117.

Carvalho, F. (1992) "Inflation, High Inflation and Hyperinflation", In: *Mr. Keynes and the Post Keynesians: Principles of Macroeconomics for a Monetary Production Economy*, Aldershot: Edward Elgar.

Carvalho, F. (1993) “Strato-inflation and high inflation: the Brazilian experience”, *Cambridge Journal of Economics*, vol.17/1, pp.63-78.

Charles, S., Dallery, T. and Marie, J. (2021) “Covid-19 et imbrication des crises : réhabiliter le keynésianisme pour refonder la politique macroéconomique”, *Revue de la régulation. Capitalisme, institutions, pouvoirs*, vol.19, doi: 10.4000/regulation.18390

Charles, S., and Marie, J. (2016) “Hyperinflation in a small open economy with a fixed exchange rate: A post Keynesian view”. *Journal of Post Keynesian Economics*, vol.39/3, pp.361–386. doi:10.1080/01603477.2016.1200950

Charles, S., and Marie, J. (2017) “Bulgaria’s hyperinflation in 1997: Transition, banking fragility and foreign exchange” *Post-Communist Economies*, vol.29/3, pp.313–335, doi:10.1080/14631377.2017.1339476

Charles, S., and Marie, J. (2020) “A note of the competing causes of high inflation in Bulgaria during the 1990s: money supply or exchange rate?”, *Review of Political Economy*, vol.32/3, pp.433-43, doi: [10.1080/09538259.2020.1787002](https://doi.org/10.1080/09538259.2020.1787002)

Charles, S., and Marie, J. (2021) “How Israel avoided hyperinflation. The success of its 1985 stabilization plan in the light of post-Keynesian theory”. *Review of International Political Economy*, vol.28/3, pp.528-558, doi: 10.1080/09692290.2019.1699146

Davidson, P. (1992) *International Money and the Real World*. 2nd ed. New York: Macmillan, 1992. [Originally published in 1982.]

De Grauwe, P. and Polan, M. (2005) “Is Inflation Always and Everywhere a Monetary Phenomenon”, *The Scandinavian Journal of Economics*, vol.107/2, pp.239-59.

Desmedt, L. (2021) « De l’hyperinflation au ‘miracle monétaire’ : l’expérience hongroise de 1945-1946 », *Revue Économique*, vol.72, pp.259-287.

Dow, S. (1999) “International Liquidity Preference and Endogenous Credit.” In J. Deprez and J.T. Harvey (eds.), *Foundations of International Economics: Post-Keynesian Perspectives*. London: Routledge, pp.153–170.

Drabo, D. (2018) « De la réforme agraire à l’hyperinflation : l’expérience zimbabwéenne (1997-2008) », *Revue de la régulation. Capitalisme, institutions, pouvoirs*, n°24, doi: 10.4000/regulation.13846

Drabo, D. (2019) *Pratique monétaires et dynamiques hyperinflationnistes : étude historique et théorique*, Thèse de doctorat, Université de Bourgogne, mars.

Dutt, A. K. (1987) “Alternative closures again: a comment on growth, distribution and Inflation”, *Cambridge Journal of Economics*, vol.11/1, pp.75-82.

Eichner A. S. and J. A. Kregel (1975) “An Essay on Post-Keynesian Theory: A New Paradigm in Economics”, *Journal of Economic Literature*, vol.13/4, pp.1293-1314.

Franco, G. H. B. (1986) “*Aspects of the Economics of Hyperinflation: Theoretical Issues and Historical Studies of Four European Hyperinflations*”, Unpublished Ph.D. diss.. Harvard University.

Franco, G. H. B (1990) "Hiperinflação – teoria e prática". In : Rego, José Márcio (org.) *Inflação e Hiperinflação : interpretações e retórica*. São Paulo : Editora Bional.

Frenkel, R. (1979) "Decisiones de Precio en Alta Inflacion", *Desarrollo Economico*, vol.19/75, pp.291–330, doi:10.2307/3466689

Hanke, S. H. and Krus, N. (2012) “World Hyperinflations”, *Cato Working Paper*, no. 8.

Herrera, L.O. and Valdés, R.O. (2004) “Dedollarization, Indexation and Nominalization: The Chilean Experience”, *Economic and Social Study Series, Inter-American Development Bank*, July.

Jadresic, E. (2002) “Wage indexation and output stability revisited”, *Journal of Money, Credit, and Banking*, vol.34/1, pp.178-196.

Jany-Catrice, F. (2020) *A Political Economy of the Measurement of Inflation. The Case of France*, New York: Springer Publishing.

Jessop, R. (1995) *The Regulation Approach, Governance and Post-fordism, Economy and Society*, Oxford: Blackwell Publishing.

Kaldor, N. (1982) *The scourge of monetarism*. Oxford: Oxford University Press.

Kalecki, M. (1962) “A model of hyperinflation”, *The Manchester School*, vol.30/3, pp.275–281. doi:10.1111/j.1467-9957.1962.tb00332.x

Kalecki, M. (1971) “Class struggle and the distribution of national income”, *Kyklos*, vol.24/1, pp. 1-9.

Keynes, J.M. (1936) *The General Theory of Employment, Interest, and Money*, London: Macmillan.

Kulesza, M. (2017) “Inflation and hyperinflation in Venezuela (1970s-2016). A Post-Keynesian interpretation”, *IPE Working Papers*, n°93.

Lavoie, M. (1992) *Foundations of Post-Keynesian Economic Analysis*, Cheltenham, UK: Edward Elgar

Lavoie, M. (2014) *Post-Keynesian Economics: New Foundations*, Cheltenham, UK: Edward Elgar.

López Gallardo, J., and Mansilla R. (2007) “The Latin American theory of inflation and beyond”, in Pérez Caldentey E., and Vernengo M. (eds), *Ideas, Políticas and Economic Development in the Americas*, Routledge: New York, pp.81-97.

Marie, J. (2010) “Inflation in Argentina during the Second Peronist Period (1973-76): A Post-Keynesian Interpretation”, *Review of Political Economy*, vol.22/2, pp.281-299, doi: 10.1080/09538251003665677.

Marie, J. (2014) “Hyperinflation argentine de 1989: une interprétation post-keynésienne”. *Revue de la Régulation. Capitalisme, institutions, pouvoirs*, vol.15, doi: 10.4000/regulation.10794

McLeay, M., Radia A., Thomas, R. (2014) “Money creation in the modern economy”, *Quarterly Bulletin of the Bank of England*, March.

Morlin, G.S. (2017) *Inflação, salários e conflito em uma economia aberta: análise do modelo escandinavo de inflação*. Unpublished Masters dissertation, Institute of Economics, Federal University of Rio de Janeiro.

Nevile, J. W. and Kriesler, P. (2008) “Expectations and unemployment”, in Wray, L. R. and Forstater, M., *Keynes and Macroeconomics after 70 Years. Critical Assessments of The General Theory*, Cheltenham, UK: Edward Elgar, pp. 309-320.

Noyola Vázquez, J. F. (1956) “La evolución del pensamiento económico en el último cuarto de siglo y su influencia en la América Latina”, *El Trimestre Económico*, vol.23/91, pp. 269-283.

Orléan, A. (2007) « Crise de souveraineté et crise monétaire : l’hyperinflation allemande des années 1920 », in Bruno Théret (éds.), *La monnaie dévoilée par ses crises*, vol. 2, Paris : Éditions de l’EHESS, pp. 185-219.

Pazos, F. (1963) “Notas para un estudio de la espiral inflacionaria”, *El Trimestre Económico*, vol.30, pp.601–619.

Pazos, F. (1972) *Chronic Inflation in Latin America*. New York: Praeger Publishers.

Perry, N. and Cline, N. (2013) “Wages, Exchange Rates, and the Great Inflation Moderation: A Post-Keynesian View”, *Levy Economics Institute of Bard College Working Paper*, n°759

Pérez Caldentey, E., Perry, N. and Vernengo M. (2020) “The return of Keynes and the Phillips curve in Latin America: evidence from four countries”, *Review of Keynesian Economics*, vol.8/1, pp.84-101.

Prager, J. (1986) “Wage indexation and the Israeli labor market: The institutional imperative.”, *International Journal of Middle East Studies*, 18(3), pp.259–273.

Phipps, A.J. (1981) “The impact of wage indexation on wage inflation in Australia: 1975(2)-1980(2)”, *Australian Economic Papers*, vol.20/37, pp.333-350.

Reinhart, C. and Savastano, M. (2003) “The Realities of Modern Hyperinflation”, *Finance and Development*, vol.40/2, pp. 20-23.

Robinson, J. (1951) “The economics of hyperinflation”, In J. Robinson (Ed.), *Collected economic papers* (Vol.1, pp. 69–77). Oxford: Basil Blackwell.

Robinson, J. (1964) "Full Employment and Inflation", In J. Robinson (Ed.), *Collected economic papers* (Vol.2, pp.271-9). Oxford: Basil Blackwell.

Ros, J. (1989) "On inertia, social conflict, and the structuralist analysis of inflation", *Kellogg Institute Working Paper*, n°128.

Rowthorn, R.E. (1977) "Conflict, Inflation and Money" *Cambridge Journal of Economics*, vol.1/3, pp.215–229.

Saboin-Garcia, J.-L. (2018) "The Modern Hyperinflation Cycle: Some New Empirical Regularities", *IMF Working Paper*, n°18/266.

Serrano, F. (2010) "O conflito distributivo e a teoria da inflação inercial", *Revista da Economia Contemporânea*, vol.14/2, pp. 395-421.

Setterfield, M. (2006) "Is inflation targeting compatible with Post Keynesian economics?", *Journal of Post Keynesian Economics*, vol.28/4, pp. 653-71.

Setterfield, M. (2007) "The rise, decline and rise of incomes policies in the US during the post-war era: an institutional-analytical explanation of inflation and the functional distribution of income", *Journal of Institutional Economics*, vol.3/2, pp. 127-46

Setterfield, M. and J. Cornwall (2002) "A neo-Kaldorian perspective on the rise and decline of the Golden Age", in M. Setterfield (ed.), *The Economics of Demand-Led Growth: Challenging the Supply Side Vision of the Long Run*, Cheltenham: Edward Elgar.

Sheard, P. (2013) "Repeat After Me: Banks Cannot And Do Not "Lend Out" Reserves", *Standard & Poor's Ratings Direct*, 13 August.

Simonsen, M. H. (1970) *Inflação: Gradualismo e Tratamento de Choque*. Rio De Janeiro: APEC.

Simonsen, M.H. (1995). *Trinta Anos de Indexação*. Rio de Janeiro: Editora FGV.

Stirati, A. (2001) “Inflation, Unemployment and Hysteresis: An alternative view”, *Review of Political Economy*, Vol.13/4, pp.427-451.

Stockhammer, E. (2008) “Is the NAIRU Theory a Monetarist, New Keynesian, Post Keynesian or Marxist Theory?”, *Metroeconomica*, vol.59/3, pp.479–510, doi: 10.1111/j.1467-999X.2008.00314.x

Sunkel, O. (1960) “Inflation in Chile: An Unorthodox Approach”, *International Economic Papers*, vol.10, pp.107–131.

Taylor, L. (2004) *Reconstructing Macroeconomics: Structuralist Proposals and Critiques of the Mainstream*, Harvard: Harvard University Press

Théret, B. (2007) *La monnaie dévoilée par ses crises*, Paris : Editions de l’EHESS

Vera, L. (2013) “A note on the Pazos-Simonsen mechanism and Kaldor’s early research on Latin American inflation”, *Brazilian Journal of Political Economy*, vol. 33/2, pp.260-280.

Vera, L. (2017) “The Distribution of Power and the Inflation-Unemployment Relationship in the United States: A Post-Keynesian Approach”, *Review of Radical Political Economics*, vol.49/2, pp.265-285, <https://doi.org/10.1177/0486613415621743>

Vernengo, M. (2005) “Money and Inflation: A Taxonomy”, *Department of Economics of the University of Utah Working Paper Series*, n°2005-14.

Warren, N. A. (1980) “Wage Indexation in Australia and the Role of a Gross Earning Deflator”, *Fiscal Studies*, vol.1/3, pp.60-64.

Weintraub, S. (1978) “The missing theory of missing wages”, *Journal of Post Keynesian Economics*, vol.1/2, pp.59-78.

Williams, C. G. (1981) “Joan Robinson and Unions, Distribution and Inflation”, *Relations industrielles / Industrial Relations*, vol.36/3, pp.576-588.