Price and Wage Inflation in Brazil: an empirical analysis from 1999 to 2022

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ABSTRACT

This paper discusses the trajectory of inflation in Brazil after the adoption of the Inflation Targeting Regime, aiming to identify its main determinants from a post-Keynesian approach that points out the relevance of distributional conflict for inflation dynamics. A descriptive analysis of inflation behavior in Brazil is carried out, in which four distinct phases are identified: 1999 to 2004, 2005 to 2010, 2011 to 2015 and 2016 to mid-2022. Changes in the Broad Consumer Price Index (IPCA) during these phases are explained by three main reasons: (i) imported inflation and exchange rate; (ii) administered prices; and (iii) wage inflation. Thus, it is argued that inflation in Brazil was mostly generated by cost pressures. We estimate Phillips curves that incorporate cost and demand elements in order to identify which of them exerted the greatest influence on the inflation rate as measured by the IPCA. The estimation was performed with Vector Error Correction (VEC) models from March 2013 to January 2022. A complementary model was estimated to investigate the long-term relationship between imported inflation and demand pressures on price inflation.

Keywords: Distributional conflict; IPCA; Brazil; Inflation targeting regime.

INTRODUCTION

In 1999 the Inflation Targeting Regime (ITR) was implemented in Brazil, which remains in force to this day. Since then, the Central Bank of Brazil (BCB, in Portuguese) has been legally mandated to keep the inflation rate, measured by the Broad Consumer Price Index (IPCA), within a target set by the National Monetary Council (CMN, in Portuguese) currently composed of the Minister of Finance (Chairman of the Council), the Minister of Planning and the President of the Central Bank. Shortly after the adoption of the ITR, inflation in Brazil missed the target in 2001 and 2002. In the following two years the inflation target was met under the condition of adjustment from 3.25% to 8.5% in 2003 and from 3.75% to 5.5% in 2004. In subsequent years, inflation remained below the upper limit of the target, except for 2015 and 2021, when the variation in the IPCA was 10.7% and 10.1%, respectively.

This paper aims to assess the behavior of Brazilian inflation after the adoption of the ITR and identify its main determinants, using as a theoretical framework, the post-Keynesian theory of inflation, in the broad sense of Lavoie (2014), that includes 'fundamentalist' post-Keynesian, Kaleckian and Sraffian approaches. which have in common the focus on the role of distributional conflict in the dynamics of the inflationary process. In this sense, the first section of this paper summarizes the post-Keynesian inflation theories.

Next, the second section investigates the behavior of Brazilian inflation dynamics after the adoption of the Inflation Targeting Regime, assessing the factors of the macroeconomic context and economic policy conduct that exerted an influence on the IPCA in this period. The analysis is divided into four main periods: from 2000 to 2004, 2005 to 2010, 2011 to 2015 and 2016 to mid-2022. Based on the assumption that inflation in Brazil is mostly driven by cost pressures, we investigate the impact on Brazilian inflation of its main inflation determinants for the period studied: (i) imported inflation and the exchange rate; (ii) administered prices[1]; and (iii) wage inflation.

In the third section, an econometric analysis of inflation dynamics in Brazil is developed, with the estimation of Phillips curves that incorporate cost and demand elements to identify those that exert the greatest influence on inflation measured by the overall IPCA. Section 3.1 presents an empirical literature review of different studies with inflation models. Section 3.2 sets out the database used in the estimation process, followed by section 3.3, which explains the methodology used and the results of the empirical work.

The study uses Vector Error Correction (VEC) models that incorporate, in addition to economic activity indicators, variables that represent cost pressures, which include wage inflation, imported inflation and productivity indicators. Models were estimated with monthly frequency and a time window

[1] Administered prices include utilities services (fixed telephone fees, residential electricity etc.), oil by-products, and private health plans, that is, prices that are or determined (or authorized) directly by government or are governmental permission that include some sort of price indexation.

from March 2013 to January 2022. The estimation was performed with models whose endogenous variables were price inflation and wage inflation, while a combination of different variables representing the other sources of inflationary pressures were used as exogenous variables. In addition to the main models, a complementary VEC model including indicators of demand pressure and imported inflation in the vector of endogenous variables was estimated in order to investigate in more detail the long-term relationship between these variables and price inflation.

1. HETERODOX INFLATION THEORIES

This article has as its theoretical framework the post-Keynesian theories of inflation, in the broad sense of Lavoie (2014), which includes streams such as the 'fundamentalist' post-Keynesian, Kaleckian and Sraffian. Unlike theories that consider inflation as a phenomenon resulting only from demand factors, the post-Keynesian approach analyzes inflation as a phenomenon resulting from conflict over income distribution, recognizing the relevance of cost elements to inflation. The next sections focus on the development of inflation theories for these three approaches, seeking to understand how the assessment of the inflationary phenomenon is carried out for each one[2].

1.1 Fundamentalist post-Keynesians

Davidson (2011) describes possible causes for the increase in the price level, recognizing that each type of inflation has a particularity of emergence and transmission. In his classification, the possibility of demand inflation, which Keynes (1936) called "*true inflation"*, is admitted. However, this type of inflation would only occur in the case of full employment - that is, when the employment gap is no longer positive[3]. In this way, post-Keynesian authors agree on the fact that, in general, demand-pull inflation is not the cause of the increase in the price level. When the economy is operating below the full employment level, inflation is caused by the supply side - i.e. by distinct cost pressures that are passed on to prices.

In this sense, in addition to demand inflation, Davidson (2011) systematizes an inflationary classification with the following supply pressures: (i) wage inflation, (ii) monopoly grade inflation or profit inflation, (iii) diminishing returns inflation, (iv) imported inflation and (v) inflationary shocks. In addition to these, Sicsú (2003) also describes (vi) tax inflation. The increase in the domestic price level can occur by only one of these processes or by a combination of them.

For 'fundamentalist' post-Keynesians, inflation occurs in economies that use money and monetary contracts to organize production and exchange processes. Inflation, therefore, is always a result of attempts to alter the distribution of money income among agents in the economy. For this reason, it is

[2] The distinction between heterodox streams made in this paper is used as a facilitator for the exposition of the main differences of each cost inflation theory. It is very common for authors to use more than one theory to build models and analyze inflationary episodes.

[3] Smithin (2003) adds the caveat that full employment should be interpreted as a genuine measure of capacity utilization, rather than the natural rate measure employed by the orthodox literature.

argued that such approach sees inflation as a symptom of a conflict over the current distribution of income. Regarding the role of distributional conflict in modeling the inflationary process, Davidson (2011) describes the model developed by Weintraub (1961), in which the author simplifies the analysis of price inflation in equation 1.1:

$$p = k(w/A) \tag{1.1}$$

where *p is* the price level, *A* is the average physical productivity of labor, *w is* the money wage rate, *w/A* is the unit labor cost of production (or efficiency wage), and *k* is the gross profit mark-up. This equation summarizes the important finding that the price level of goods and services produced in the private sector is related to the profit margin of firms and the unit labor cost. Thus, in order to achieve the objective of inflationary control, it is necessary to avoid increases in the gross profit margin and limit the rate of change of monetary wages to the change in labor productivity (DAVIDSON, 2011).

1.2 Kaleckians

According to the Kaleckian models of inflation, the origin of price variation lies in the distributive conflict over the distribution of income, with two classes participating in this conflict: workers, who set wage targets; and capitalists, who set mark-up targets. Such models of inflation due to distributional conflict are based on two main equations, which express the dispute between workers and capitalists over the income received by each of the groups. This section presents the model discussed in Dutt (1987) and developed by Lavoie (2014), assuming a closed economy and constant productivity. The first equation expresses that the growth rate of nominal wages ($\widehat{w}$) is a function of the past period price inflation rate ($\hat{p}_{-1}$)[4] and the difference between the real wage targeted by labor unions (ω_d) and the real wage observed in the previous period (ω_{-1}) – represented by the following relationship:

$$\widehat{w} = \Omega_1(\omega_d - \omega_{-1}) + \Omega_2\hat{p}_{-1} \tag{1.2}$$

where Ω_1 represents workers' bargaining power, indicating the intensity with which unions will react to a difference between the observed real wage and their desired level; and Ω_2 is the degree of price indexation for changes in the nominal wage.

For the second equation of the model, two assumptions are made: (i) capitalists (or firms) wish to pass though increases to wage costs; and (ii) firms will wish to increase the prices of their products when the actual mark-up is below the targeted mark-up level. Reformulating assumption (ii) in terms of the real wages that firms wish to pay (ω_f), we have the equation that represents the rate of price inflation:

$$\hat{p} = \Gamma_1\left(\omega_{-1} - \omega_f\right) + \Gamma_2\widehat{w} \tag{1.3}$$

where Γ_1 represents the bargaining power of firms and Γ_2 represents the degree of wage indexation to prices. From relation 1.3, it follows that if firms seek lower real wage rates, given the observed real wage

[4] As emphasized by Neville and Kriesler (2008, apud LAVOIE, 2014), wage demands are generally not an attempt to anticipate future inflation, but rather to recompose losses in purchasing power caused by inflation.

rate, they can increase price inflation. The outcome of the equation depends on the bargaining power of firms, while the general solution of the model depends on the bargaining power of both classes: capitalists and workers. In the most general case, neither group has absolute bargaining power, nor the ability to fully index price and wage increases.

The basic model of distributional conflict presented can be modified to explore various hypotheses. It would be possible to consider the case of an open economy by including the external sector as a third agent capable of interfering in the distribution of income between workers and capitalists. For example, if we consider a situation in which the exchange rate has depreciated and this movement has caused an increase in the prices of imported commodities in domestic currency, this may decrease the disposable income between workers and capitalists. The former group should react by demanding wage increases, while the latter should raise commodity prices to maintain their mark-up. This means that there should be an increase in the difference between desired and observed real wages by both classes involved in the conflict (SANTORO, 2020; LAVOIE, 2014).

1.3 Sraffians

The Sraffian school of thought also assumes the existence of a distributional conflict, considering it an essential phenomenon for understanding inflation. In this sense, Serrano (2007) presents a theory of inflation based on three main assumptions. First, potential output is assumed to adjust to the trend in effective demand via induced investment. Second, partial inertia is assumed – a more realistic assumption than considering total inertia. Third, distributional conflicts are assumed to exist and these conflicts are not necessarily a temporary phenomenon, so that supply shocks with upward inflation pressures mean that some group wants positive nominal increases in their compensation.

Assuming these three hypotheses, the core or trend inflation depends on supply shocks (c) and the degree of inertia (a):

$$\hat{p} = c/(1-a) \tag{1.4}$$

Thus, the core of inflation is a "*cost-push*" phenomenon, i.e. determined by supply factors. A permanent increase in c would lead to a permanently high level of core inflation. On the other hand, demand shocks have only a temporary effect on inflation. Therefore, in the short run, inflation is determined by:

$$\hat{p} = a\hat{p}_{-1} + b(u-1) + c \tag{1.5}$$

where u is the degree of capacity utilization, expressed as the ratio of the actual output (y) and its potential level (y^*), so that the term $(u-1)$ represents the output gap in the economy. Considering the three assumptions of the Sraffian theory of inflation presented above, it follows that a *one-for-all* increase in the rate of growth of demand will lead to permanently higher inflation. This is because it will increase the growth of the capital stock and potential output, as capacity adjusts to demand, and will cause a permanent fall in the unemployment rate, strengthening workers' bargaining power and causing a real increase in

wages[5]. Therefore, a trade-off between cost-push inflation and the unemployment rate is admitted. In this case, a permanent reduction of the output growth rate can be considered as the long-term cost of an inflation control policy (SERRANO, 2019).

2. BRAZILIAN INFLATION DYNAMICS AFTER ADOPTION OF THE ITR AND ITS MAIN DETERMINANTS

Based on the trajectory of the inflation rate in Brazil after the adoption of the Inflation Targeting Regime (ITR) in 1999, we divided the analysis into four distinct periods: from 2000 to 2004, from 2005 to 2010, from 2011 to 2015 and from 2016 to mid-2022.

In the period from 2000 to 2004 the inflation rate was very close to or above its target. The cause of this upward pattern can be attributed to the increase in inflation related to tradable goods and administered goods, which is directly related to the strong devaluation of the real in this period.

After 2005, there was a change in inflation behavior, with lower annual rates, between 3% and 6%, until 2010. The period was marked by a change in relative prices, with services inflation exerting upward pressure on the IPCA and, on the other hand, two subgroups exerting pressure below the target: (i) administered inflation, driven by regulatory changes and changes in indexation mechanisms; and (ii) industrial goods inflation, influenced by the exchange rate appreciation movement from 2003 onwards, which softened the impact of the rise in commodity prices. Services inflation was pressured by the effects of economic growth and the increase in average wages on the cost of production of entrepreneurs and on consumption and demand for goods and services by the population.

From 2011 onwards, a currency devaluation movement began, which, despite the fall in commodity prices, put upward pressure on administered and food prices. In addition, the water crisis and energy tariff adjustments contributed to the increase in administered inflation. Due to these factors, and the inflationary pressure from services prices, the period from 2011 to 2014 was characterized by inflation rates closer to the upper limit of the target - and culminated in its non-compliance in 2015.

After 2016, services inflation declined substantially and the main causes of headline inflation were the increase in administered prices, as well as, in certain specific years, the rise in tradable goods inflation, which raises food prices. From 2020 onwards, the global COVID- 19 crisis and consequent breakdown of global value chains, together with elements of global political instability and the water crisis in Brazil, caused an increase in strategic prices such as oil and energy. In this context, from 2021 to mid-2022 the IPCA rises both due to increases in administered and food inflation, as well as increases in industrial goods and services, in view of the rise in production costs.

[5] Unless there is an increase in nominal profit margins that can compensate for the rise in real wages.

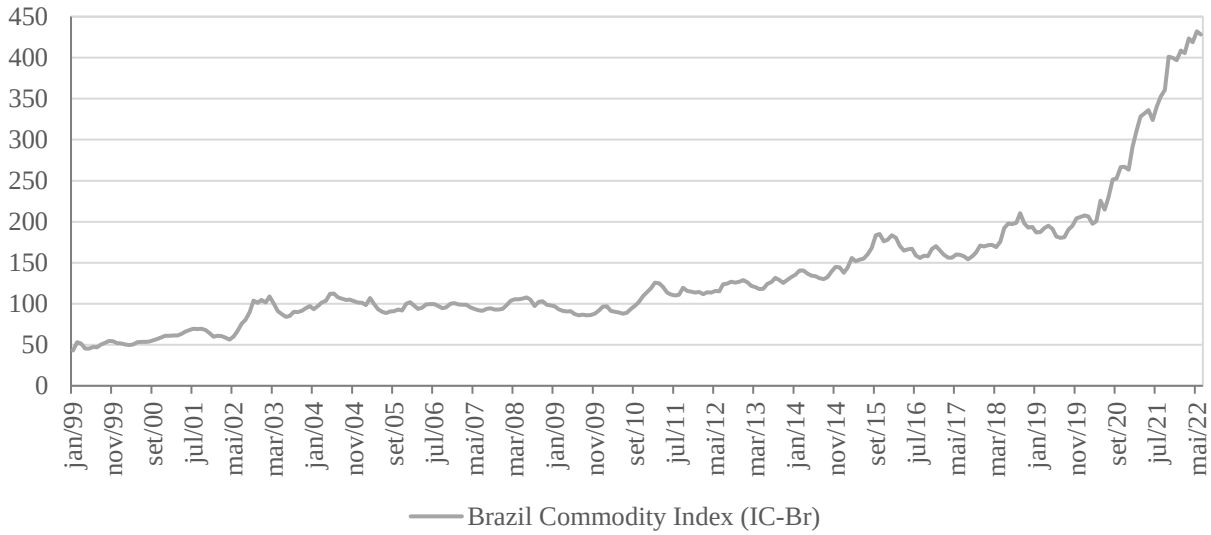
The following sections present a detailed analysis of the main elements causing inflationary pressures in Brazil for the period studied: (i) imported inflation and exchange rate policy; (ii) administered inflation; and (iii) wage inflation and distributional conflict.

2.1 Imported inflation and exchange rate policy

From 1999 to the end of 2002, there was relative stability in the behavior of import prices in dollars. On the other hand, the nominal exchange rate showed a strong devaluation trend, a movement that was influenced both by the international instability scenario with the *default of* Argentina and by a crisis of confidence in Brazil due to the uncertainty regarding the presidential election. In this way, it is argued that the exchange rate devaluation process from 1999 to 2002, followed by the onset of a rise in the prices of imported products from 2003 onwards, resulted in an imported inflation shock, contributing to the inflationary surge in the initial period of the ITR (from 1999 to 2004). This movement can be seen in the path of the BCB Commodity Index (IC-Br), which weights the prices in real (Brazilian currency) of the commodities most relevant to Brazilian inflationary dynamics. There was a slight increase in the IC-Br from the mid-2000s to the end of 2001, followed by a more sharp increase from mid-2002 to the beginning of 2003, in which the index jumped from 56.2 R$ in April 2002 to 109.1 R$ in February 2003 (**Figure 1**).

From 2003 onwards, a process of strong exchange rate appreciation began that lasted until mid-2011, with the exception of a one-off reversal in the second half of 2008. The path of the exchange rate is directly related to the improvement of the international scenario, in which the price of commodities increased from mid-2003 to mid-2011, influenced by the growing demand of the Chinese economy for these goods. In addition, low international interest rates stimulated foreign private capital to flow to Brazil, so that the BCB was able to reduce the Selic rate and still sustain a positive interest differential with respect to the external interest rate, maintaining a trend of exchange rate appreciation (PAULA; PIRES, 2017; SERRANO; SUMMA, 2015a).

Figure 1: Brazil Commodity Index (IC-Br): January 1999 to June 2022



Source: BCB; prepared by the authors.

After 2005, although import and export prices in dollars were rising, the exchange rate appreciation until mid-2011 transformed positive commodity shocks in dollars into negative shocks in reais - thus alleviating the impact of imported inflation on domestic prices. This is reflected in the relative stability of the BCB Commodity Index (IC-Br), which remained at the same level between 2005 and 2010. Thus, the commodity boom and the greater inflow of foreign capital allowed for an appreciation of the currency, contributing to the control of inflation in Brazil.

From mid-2011 onwards, the movements reversed: import and export prices in dollars started to fall until mid-2015, while the exchange rate depreciated continuously, with a more intense peak at the end of that year. The combination of these two elements translates into the return of positive cost shocks, putting upward pressure on inflation and contributing, among other factors, to the failure to meet the inflation target in 2015. From that year onwards, inflation decreased in level and remained relatively controlled, until a new external cost shock in the second half of 2020 due to the increase in commodity prices and the strong currency devaluation, as a result of the COVID-19 crisis, the breakdown of global value chains and elements of international political instability.

2.2 Administered prices

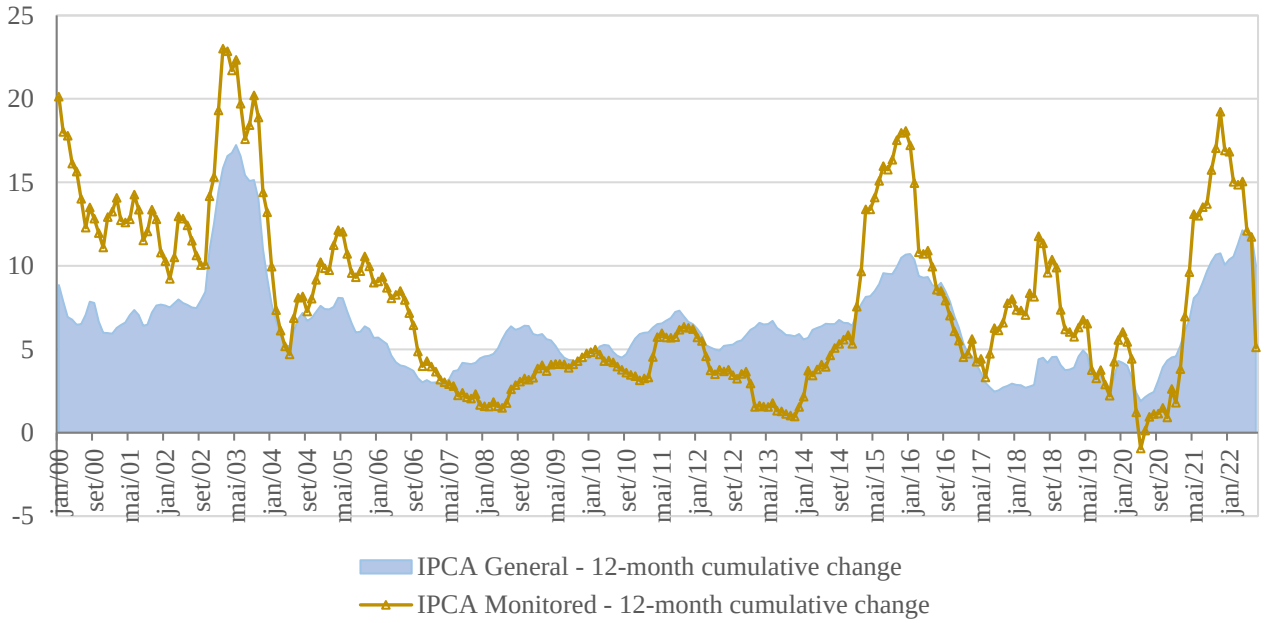
The behavior of administered prices is essential for understanding Brazilian inflationary dynamics. As mentioned in the previous section, the administered IPCA was the main driver of inflationary growth from 2000 to 2005. This is because the very structure of administered price formation in Brazil amplified the inflationary effect of rising commodity prices in reais. Until mid-2005 this category seemed to follow the General Price Index - Market (IGP-M), which was used in most of the administered price adjustment contracts signed during the privatization process of the 1990s. The IGP-M is more influenced by wholesale and producer prices and is consequently also more affected by the prices of tradable products (SERRANO; SUMMA, 2015b).

From mid-2005 onwards, there was a structural drop in the contribution of administered prices to overall inflation, driven by policies with an explicit focus on reducing high inflation in this IPCA grouping. There were changes in the indexation mechanisms of some administered prices, such as revisions in the rules for the adjustment of electricity and telephone tariffs (MARTINEZ, 2012). In addition, there was also a policy of maintaining the stability of nominal gasoline and diesel prices in Brazil, first by Petrobras, and after 2008 with assistance from the Treasury with indirect taxes on fuels to smooth the domestic price of oil (SERRANO; SUMMA, 2012).

These changes, coupled with an exchange rate appreciation movement, altered the inflationary dynamics of administered prices, so that from 2006 to 2013 this category began to systematically push inflation below target. **Figure 2** shows the trajectory of the administered IPCA, with a significant increase

in the series in 2002 and 2003. After mid-2006, administered inflation decreased, remaining between 1% and 6% until 2014.

Figure 2: General and administered IPCA inflation rate: January 2000 to July 2022



Source: BCB; prepared by the authors.

From 2014 onwards, and more intensely in early 2015, an upward trend in administered prices was observed, culminating in annual inflation of 18.1% in 2015 - the highest in this group in the entire period after the implementation of the ITR. According to the BCB Inflation Report of March 2016, the increase in administered prices, due to adjustments in electricity and gasoline tariffs, was one of the main factors responsible for upward inflationary pressures in 2015. Another relevant factor was the increase in free price inflation, driven both by the pass-through of the increase in administered prices and by supply shocks that directly impacted food prices in the year (BCB, 2016). From mid-2017 to mid-2018 there was a new upward movement in the administered IPCA, this time more moderate compared to 2015, again driven by higher electricity and fuel inflation. On the other hand, there was no upward pressure from free prices, contributing to inflation remaining below target in these years.

In 2020, the IPCA for administered items starts the year falling. However, soon afterwards, the prices of this group increase significantly again due to the sharp rise in commodity prices in reais, the result of imbalances in global production chains, which impacted the prices of fuels and other inputs, and the intensification of exchange rate devaluation throughout the year. In addition, the water crisis in Brazil also affected electricity production. Thus, inflation of administered items jumped from 2.6% in 2020 to 16.9% in 2021 - with the emphasis on the increase in inflation of vehicle fuels (49%), household fuels (36%) and residential electricity (21.2%) in the latter year.

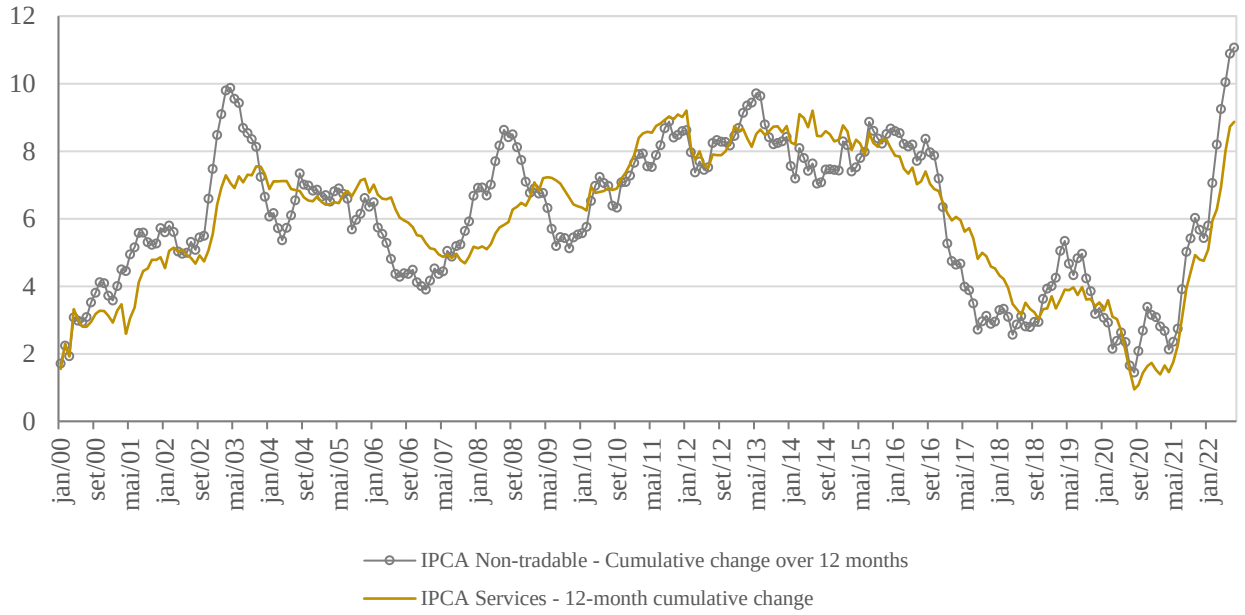
In addition to directly impacting the administered price category, the increase in prices such as fuel and energy, associated with the shortage of some industrial inputs, represented a cost increase that was reflected in the price increase of all free price categories. As of the end of 2021, 12-month cumulative administered inflation declines from 19.2% in November 2021 to 5.1% in July 2022.

2.3 Wage inflation, distributional conflict and workers' bargaining power

From 2006 onwards there seems to have been a shift in relative prices in Brazil: services prices started to show an upward trend relative to the other groupings. **Figure 3** shows that, in general, services inflation remained on the rise from 2006 to 2011, with the exception of a sharp drop in 2009, and remained at a high level until 2015. After 2016, there was a significant reduction in services inflation, until it grew again with greater intensity in 2021. Martinez (2012; 2015) argues that, after 2006, the main contributions to deviations above the inflation target were positive variations in the services and food IPCA.

The behavior of services inflation in Brazil is more related to the country's economic and labor market conditions (MARTINEZ, 2012; 2015) - being less influenced by international price shocks compared to the other free price groups (household food and industrial goods). For this reason, the dynamics of services inflation behave similarly to those of non-tradables inflation. This is because, according to BCB (2013b), most of the items that make up services inflation currently fall into the "labor-intensive services" and "miscellaneous services" segmentations, containing few tradable items.

Figure 3: IPCA inflation rate of non-tradables and services: January 2000 to July 2022



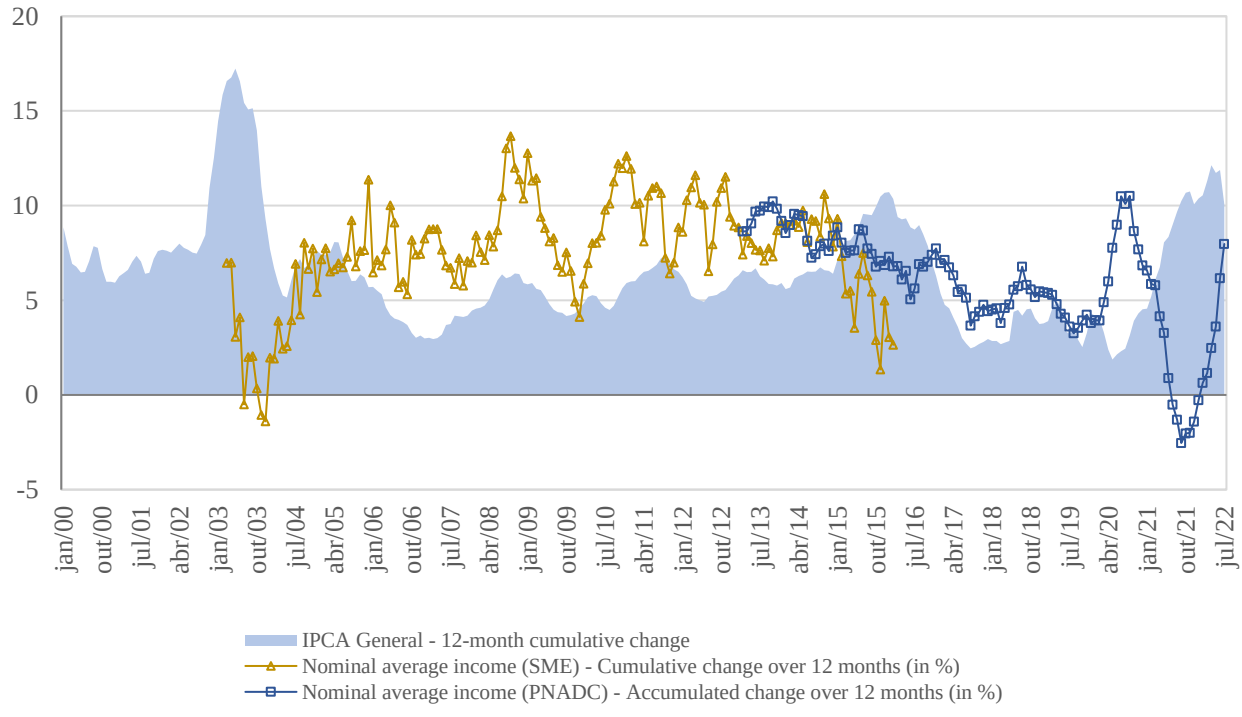
Source: BCB; prepared by the authors.

In this sense, it is argued that the growth in relative prices of services from 2006 onwards is related to changes in the labor market and the expressive income growth in Brazil, stimulated by the growth

model adopted by the government at the time. In the 2000s, Brazil experienced a decade of demand-driven growth, with Gross Domestic Product (GDP) growth jumping from 1.4% in 2001 to 7.5% in 2010.**Erro! Fonte de referência não encontrada.** This movement occurred, on the one hand, due to the improvement of the international scenario from 2003 onwards - with the increase in China's demand for Brazilian products and the rise in commodity prices, low international interest rates and improved external financing conditions. On the other hand, Brazil took advantage of the favorable external scenario, with federal government seeking to foster economic growth with measures to stimulate aggregate demand through the expansion of the domestic market (SERRANO; SUMMA, 2015a). The growing activism of Brazilian economic policy included policies to increase the minimum wage, increase social transfer policies, measures to improve the availability of consumer credit and more public investments in physical and social infrastructure - all of which helped to stimulate the domestic market (BIELSCHOWSKY, 2012). In this sense, the economic growth of the time was accompanied by an increase in overall employment and the formalization of labor.

In this context, there was an upward trend in real wage growth from 2005 to 2014 - fostering a scenario of worker's increased bargaining power. **Figure 4** shows the trajectory of nominal wage variation, represented by the average nominal income per month from the Monthly Employment Survey (PME) and the Continuous National Household Sample Survey (PNADC). Between 2005 and 2012, the nominal average wage maintained growth above general headline inflation. This trend slowed down from 2013 onwards and, with the onset of the Brazilian economic recession in 2014, a reversal of this movement has been observed since 2015, with real losses in workers' purchasing power due to both the acceleration of inflation during this period and the fall in average monthly income.

Figure 4: General inflation and nominal change in wages: January 2000 to July 2022



*The increase in average income observed in 2020 was due to the statistical effect of the drop in the population in the labor force, mainly by workers in lower income strata.
Source: BCB, PME/IBGE and PNADC/IBGE; prepared by the authors.

Wage increases have the potential to affect inflation on both the supply and demand sides, since the wage component integrates the cost of labor and interferes with the cost of production of companies and, in addition, is also a determinant of consumption (BCB, 2013a). In this sense, from the mid-2000s until 2014, wage growth intensified cost pressure in the services sector for two main reasons: (i) productivity in the services sector increased below average, so that wage growth represented a cost increase; (ii) demand for services is generally income elastic and there was this increase in demand in the sector in the late 2000s (BRAGA, 2000; MARTINEZ, 2012; 2015; MORLIN; BASTOS, 2019).

This occurred because the movement of economic growth with stimulus to demand in the 2000s was also characterized by an increase in private consumption, which had direct causes, via the disposable income effect on consumption, and indirect causes, through the effect of incorporating more workers into the formal sector and with access to credit lines (KREPSKYet al, 2019; MEDEIROS, 2015). As of 2015, with the intensification of the economic recession that began in 2014 and the implementation of neoliberal austerity policies, there is a reversal of workers' bargaining power, reflected in the increase in the unemployment rate and the fall in average nominal income. Thus, the context has fostered a significant reduction in services and consumer goods inflation.

3. PRICE AND WAGE INFLATION MODELS

In this section, we conduct an econometric analysis of inflation dynamics in Brazil after the adoption of the Inflation Targeting Regime in 1999. Phillips curves incorporating cost and demand variables are estimated, following the post-Keynesian inflationary theory, to identify those that exert the greatest influence on inflation measured by the overall IPCA. Wage inflation, imported inflation and productivity indicators are considered as cost factors, while different indicators of economic activity are tested as demand pressure factors.

3.1 Empirical literature review

There is a large empirical literature on inflation dynamics in Brazil. Among the studies that deal with estimating Phillips curves, the main points are the existence of partial inertia and the relevance of imported inflation, whether by commodity prices or the exchange rate, on Brazilian inflation (SUMMA, 2011). In particular, several analyses aim to estimate the pass-through - that is, the change in domestic prices that occurs due to a 1% change in the nominal exchange rate. Examples of works on this topic are those of Belaisch (2003), one of the first to analyze the case of Brazil, Araújo and Modenesi (2011) and Pimentel et al (2016). In all three papers, the results identify the relevance of the impact of exchange rate pass-through on inflation in Brazil. In the case of Pimentel et al (2016), a strong asymmetry was identified

in the exchange rate pass-through, and the magnitude of the pass-through is greater in the case of currency depreciation. Among the existing theoretical justifications for this asymmetry in exchange rate pass-through are microeconomic reasons, such as market restrictions, technological issues and pricing strategy with market share objectives.

Other studies also show the relevance of imported inflation factors in disaggregated domestic inflation. In Braga's (2013) study, with the exception of services inflation, the exchange rate change and the change in commodity prices were significant for all price inflation categories, with the coefficient of the former always slightly higher than that of the latter. The results of Braga and Summa (2016) and Lemos (2018) suggest that commodity prices impact all inflation categories analyzed (services, industrial products, and household food).

As for demand pressures, there is no unanimity in the literature on the existence of a systematic relationship between this component and inflation. Among the studies that found no association between these two elements, focusing on aggregate inflation, are Modenesi and Araújo (2011), and Squeff (2009) and Arruda et al. (2011). For a disaggregated analysis, Bastos et al (2016) and Braga (2013) do not identify the existence of a strong relationship between demand and inflation in the sectors analyzed. On the other hand, Braga and Summa (2016) and Lemos (2018) identify a significant impact of the demand component only on household food inflation. However, this result should be analyzed with caution, since the result of the Wald exogeneity test indicates that the unemployment gap does not cause the inflation of the analyzed category, but rather the opposite - suggesting that an increase in food inflation would explain a drop in retail sales.

Although the empirical literature on inflation in Brazil is vast, most studies do not include the wage component or some productivity indicator in their specifications. Among the studies that estimate structural models, that is, that introduce wage inflation as a variable, are Braga (2013), Giovannetti and Carvalho (2015) and Lemos (2018). Braga (2013) identifies, in the aggregate model, that wage inflation was affected by price inflation considering the 12th lag, indicating a reaction to recompose purchasing power. Price inflation was affected by wages in the disaggregated models of services inflation and non-durable consumer goods inflation - the latter probably because it includes the category of food away from home, which can be seen as a provision of services. Lemos (2018) finds evidence that the nominal income component with a formal contract positively impacts services and food inflation at home. Giovannetti and Carvalho (2015), specifically analyzing the services sector, indicate a positive response of services inflation to a boost in nominal wages, peaking between the third and fourth quarter. Comparatively, in the complementary model that controls for sectoral productivity this impact was smaller, suggesting that productivity increases reduce the pass-through of wage variation to services inflation.

In Braga and Summa (2016) the inertial component appears to be more relevant for services inflation, compared to other disaggregations of inflation. This may be influenced by the fact that it is a mostly non-tradable, labor-intensive sector (and thus wages are an important cost factor and more easily

passed on to prices) and by low productivity growth in the period analyzed. On the other hand, in Lemos (2018) services inflation was not sensitive to the inertial component. For administered prices, there is statistical evidence of the impact of inflationary inertia and imported inflation in this category (BRAGA; SUMMA, 2016; BRAGA, 2013; LEMOS, 2018).

3.2 Database

In this work, econometric models were estimated considering the following groups of variables: (i) price inflation; (ii) wage inflation; (iii) imported inflation; (iv) demand index; (v) productivity index. All the series used have a monthly frequency and were used in the model in first seasonal difference - that is, the month/same month variation of the previous year. The general IPCA series was used to represent inflation. For wage inflation we used the series of nominal average income usually received from all jobs from the Monthly PNADC[6] , with data in annual variation available from March 2013 to January 2022[7]. To measure imported inflation, two options were tested. The first is the Commodity Index - Brazil (IC-Br) provided by the BCB, which represents a weighting of the prices in real of commodities relevant to the Brazilian inflationary dynamics. The second option was to use the IMF dollar Commodity Price Index (IC-IMF) and the nominal exchange rate provided by the BCB separately, as done in Braga (2013).

The application of the Hodrick-Prescott (HP) filter allowed the creation of output gap measures - i.e. the difference of current output by potential output - to represent demand pressures. The non-seasonally adjusted Gross Domestic Product (GDP) gap variable was constructed using the GDP series in current values (provided by the BCB) deflated by the overall IPCA. For the seasonally adjusted GDP gap, we used the same monthly GDP series deflated by the IPCA and seasonally adjusted. The IBC gap series were also constructed using the Central Bank's Economic Activity Index (IBC-Br) provided with and without seasonal adjustment by the BCB. As an alternative to the output gap, the Installed Capacity Utilization Level (NUCI) from the Federation of Industries of the State of São Paulo (FIESP) and the unemployment rate from the PNADC Monthly were also tested.

As for the productivity measure, we used labor productivity, which, according to Cavalcante and Negri (2014), corresponds to the ratio between some measure of output, such as value added or physical production, and some measure of labor, such as the number of worked hours or the number of people employed. Productivity indices were constructed by dividing an output indicator (GDP or IBC-Br) by the number of employed persons in the Monthly PNAD:

(3.1)

[6] For model results with the wage component using data number of people employed from the General Register of Employed and Unemployed (CAGED), see Malher (2022).

[7] The Monthly PNADC provides estimates of moving quarters. In this case, although the calculation of weights is similar to that used in the calculation of conventional quarters, there is a percentage of data repetition of around 66% (1/3) between a moving quarter and the immediately following one. For this reason, complete cyclical movements are only observed in the comparison between quarters where there is no repetition of the sample, in which the information is entirely new (IBGE, 2015).

(3.2)

Table 1 presents a summary of all the variables considered in the estimation process of the econometric models.

Table 1: Summary of variables

Group	Variable	Abbreviation	Full name(s) series(es) used	Identifier	Source
Price inflation	Δ General IPCA	dIpcaGeneral	National broad consumer price index (IPCA)	433 Series	BCB/IBGE
Wage inflation	Δ Nominal average income	dRemTrab	Average nominal income usually received from all jobs	SIDRA Table 6387	PNADC
Imported inflation	Δ BCB commodity index (IC-Br)	dIcBcb	Commodity Index - Brazil (in R$)	Series 27574	BCB
	Δ IMF Commodity Index (IMF-CCI)	dIcFmi	IMF Commodity Price Index (in US dollars)[1]	-	IMF
	Δ Nominal exchange rate	dExchange	Exchange Rate - Free - US Dollar (Sell) - Period Average	Series 3698	BCB
Demand index	Monthly GDP gap[2]	GDP gap	Monthly GDP - Current values (R$ million)	4380 Series	BCB
	Seasonally adjusted monthly GDP gap[3]	GapGDPAdjustment	Monthly GDP - Current values (R$ million)	4380 Series	BCB
	IBC-Br gap	HiatoIbc	Central Bank Economic Activity Index - IBC-Br	Series 24363	BCB
	IBC-Br seasonally adjusted gap	GapIbcAdjustment	Central Bank Economic Activity Index (IBC-Br) - seasonally adjusted	Series 24364	BCB
	Δ Nuci	dNuci	Level of Capacity Utilization	-	FIESP
	Δ Nuci seasonally adjusted	dNuciAdjustment	Seasonally adjusted level of capacity utilization	-	FIESP
	Δ Unemployment rate	dDesemp	Unemployment rate	SIDRA Table 6381	PNADC
Productivity index	Δ Monthly GDP / Δ Qty of workers employed	dProductiv1	Number of persons aged 14 and over employed in the reference week (PNAD)	SIDRA Table 6323	PNADC
	Δ IBC-Br / Qty of workers employed	dProductiv2			

[1] Seasonally adjusted GDP gap constructed from the monthly GDP series deflated by the *seasonally* adjusted IPCA using the X-13ARIMA-SEATS method, with the R *seasonal* package (SAX; EDDELBUETTEL, 2018).

3.3 Estimation

3.3.1 Methodology

For the construction of the models, it was necessary to consider the existence of endogeneity between wage inflation and the inflation rate, which would justify the adoption of an Autoregressive Vector Model (VAR), since it has the ability to capture interdependence relationships between endogenous variables without the need to impose strong restrictions a priori (HARRIS, 1995). Considering the Autoregressive Vectors methodology, it is possible to apply the unrestricted VAR model, the structural VAR (SVAR) or the Vector Error Correction (VEC) model. Their choice depends on the

results of the stationarity tests of the series and the cointegration test between the endogenous variables of the model.

Augmented Dickey-Fuller (ADF) and *Kwiatkowski-Phillips-Schmidt-Shin* (KPSS) unit root tests were performed to investigate stationarity of the variables in logarithm[8]. The level analysis suggests non-stationarity of the overall IPCA series, the wage components, the imported price elements and the productivity indices. As for the demand indices, both tests point to stationarity of the output gap and Nuci series. The results for the unemployment rate series (Desemp) are contrary, as the ADF test suggests that the series is non-stationary, while the KPSS test suggests stationarity. Taking the first seasonal difference - i.e. the month/same month change from the previous year - the tests continued to suggest non-stationarity for the price inflation and wage inflation series.

Considering this result, the selection process of the main models of this work was carried out in the following order: (1) a function was created in the R *software* that estimated VEC models with different combinations of variables in the vectors of endogenous and exogenous variables; (2) the Johansen test was performed and the models in which there was at least one cointegration vector were selected; (3) then, the definition of the optimal number of lags was established by the Hannan-Quinn (HQ) and Akaike (AIC) criteria and the models that did not have serial autocorrelation in the residuals were selected by the Portmanteau test; (4) those with a high number of lags and those whose impulse response function (IRF) graphical analysis, generated from the Cholesky decomposition, presented confidence intervals that were too wide, to the point that it was not possible to indicate whether the shocks were statistically different from zero. Following this process, a selection of main VEC models was arrived at.

It is worth noting that, in the first selection step (1), VEC models were initially estimated with more variables in the vector of endogenous variables, such as imported inflation and/or a demand indicator, in addition to price and wage inflation. At this stage, the presence of a cointegration vector was identified in several models. However, most of these models lacked serial autocorrelation of the residuals. Those who did not fulfil this requirement had IRF graphs with very wide confidence intervals. For this reason, models were estimated with price inflation and a wage variation component in the vector of endogenous variables, so that the other variables were included as exogenous. With this change, it was possible to identify robust models, without serial autocorrelation of the residuals and that, at the same time, had IRF graphs from which it would be possible to elaborate an analysis of the relationship between price inflation and wage inflation - two central components for the proposal of this work. Thus, the following section presents the results of the selected VEC models.

3.3.2 Results

Table 2 presents a summary of the estimated models that have as endogenous variables the IPCA inflation rate (dIpcaGeneral) and the variation in the average compensation of the PNAD (dRemTrab),

[8] The statistical and econometric calculations of this work were performed using the R 4.0.3 software (R CORE TEAM).

with details on the performance of each variable: how many times it was statistically significant considering 5% significance and what was the sign of the impact (positive or negative). The 7 selected models presented the BCB Commodity Index (dIcBcb) as an exogenous imported inflation variable, and in all of them its impact on the inflation rate was positive and significant. In models 6 and 7, in which the IC-Br variable was inserted with 1 lag, its impact remained significant and with a magnitude similar to the case of models 1 to 5. On the other hand, none of the demand indicators were significant. In all models, a *dummy* (dummy_RemCov) was included to consider the statistical effect of an increase in average compensation between the months of May and July 2020, due to the exit of many workers in the labor force. Note that, of the 7 satisfactory models, none of them control for productivity. Models that included a productivity index in the vector of exogenous variables were estimated, but the series had a very high increase in the recovery time from the COVID-19 crisis, which generated serial autocorrelation of the residuals.

Among the models in **Table 2 Table 2**the one that showed the best result from the IRF plots was the seventh. **Figure 5** shows the positive impact of wage inflation (dRemTrab) on price inflation (dIpcaGeral) - which becomes statistically different from zero from the tenth month onwards - suggesting the existence of a long-term relationship between the variables. On the other hand, no significant impact of price inflation on wage inflation could be identified.

Table 2: Summary of VEC models estimated with PNAD data - part 1

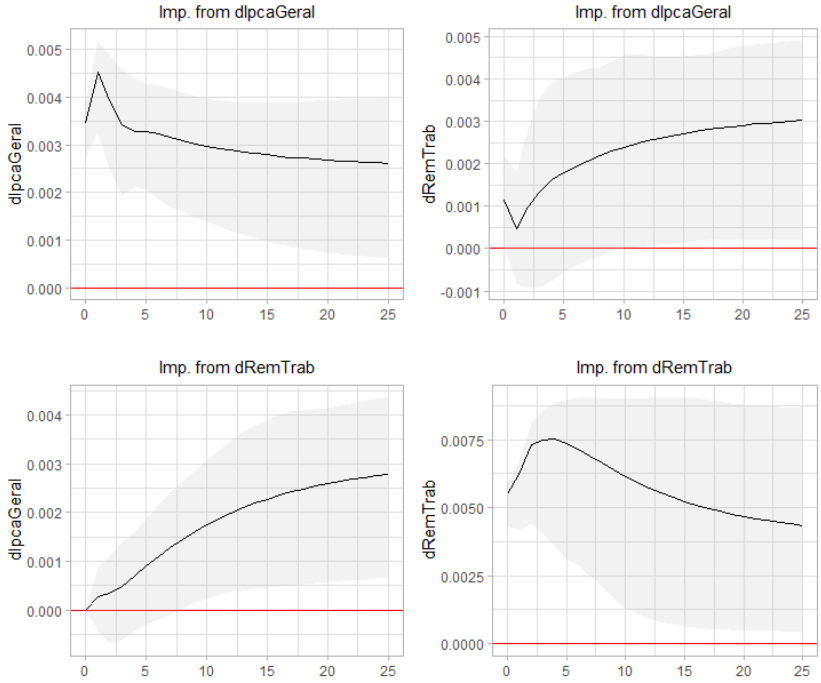
Endogenous: First seasonal difference of the General IPCA (dIpcaGeneral) and Nominal Average Income (dRemTrab)
Sample: mar/2013 to jan/2022

Identifier	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Signif. (at 5%)	Signal
Gaps	2	2	2	2	2	2	2		
Results equation dIpcaGeneral									
ECT	-0.038***	-0.037***	-0.033***	-0.036***	-0.032***	-0.04**	-0.036**	7	7(-)
dIpcaGeneral -1	0.328***	0.314**	0.306**	0.318**	0.314**	0.333**	0.329**	7	7(+)
dIpcaGeneral -2	-0.235*	-0.239*	-0.248*	-0.237*	-0.247*	-0.207*	-0.215*	7	7(-)
dRemTrab -1	-0.017	-0.012	-0.011	-0.013	-0.006	0.014	0.021	0	2(+); 5(-)
dRemTrab -2	-0.035	-0.034	-0.032	-0.032	-0.03	-0.039	-0.037	0	7(-)
dIcBcb	0.016***	0.016***	0.016***	0.016***	0.016***			5	5(+)
dIcBcb -1						0.015***	0.015***	2	2(+)
GDP gap				0.008		0.008		0	2(+)
GapGDPAdjustment					0.022		0.024	0	2(+)
HiatoIbc		0.008						0	1(+)
GapIbcAdjustment			0.024					0	1(+)
dummy_RemCov	-0.005*	-0.004*	-0.003	-0.004*	-0.003	-0.004*	-0.003	4	7(-)
Results equation dRemTrab									
ECT	0.023	0.021	0.019	0.022	0.019	0.037.	0.035.	0	7(+)
dIpcaGeneral -1	-0.303.	-0.3.	-0.311.	-0.305.	-0.306.	-0.273.	-0.271.	0	7(-)
dIpcaGeneral -2	0.135	0.137	0.14	0.138	0.141	0.141	0.143	0	7(+)

dRemTrab -1	0.165.	0.162	0.168.	0.165.	0.165	0.151	0.154	0	7(+)
dRemTrab -2	0.212*	0.21*	0.21*	0.211*	0.209*	0.226*	0.227*	7	7(+)
dIcBcb	-0.009.	-0.009.	-0.009.	-0.009.	-0.009.			0	5(-)
dIcBcb -1						-0.012*	-0.012*	2	2(-)
GDP gap				0.001		0.003		0	2(+)
GapGDPAdjustment					0.001		0.006	0	2(+)
HiatoIbc		-0.003						0	1(-)
GapIbcAdjustment			0.009					0	1(+)
dummy_RemCov	0.01**	0.009**	0.01*	0.01**	0.01**	0.01**	0.01**	7	7(+)

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Figure 5: FIR plots of model 7 with PNAD data



As an alternative to the models in **Table 2** which do not control for the impact of productivity, VEC models were estimated that have as endogenous variables price inflation (dIpcaGeneral) and a labor cost indicator - called dRemProd1 and dRemProd2, defined in equations 3.3 and 3.4, respectively:

(3.3)

(3.4)

Thus, labor cost indicators are constructed by dividing the change in the average remuneration of the PNAD (dRemTrab) by the change in a productivity indicator (dProdutiv1 or dProdutiv2). What differs between the dRemProd1 and dRemProd2 variables is the productivity index used to calculate each one.

Table 3 shows the results obtained in the empirical research. There were 5 satisfactory models, with 2 or 3 lags. In the analysis of the imported inflation components, all of them had a positive and significant impact on the inflation rate. The magnitude of the coefficient of the IC-Br in current time of models 8 and 10 was similar to the magnitude of the same coefficient with 1 lag in model 9. In the case of models 11 and 12, the exchange rate change was significant more often and presented a slightly higher coefficient

than the change in the IMF Commodity Index, following the result found in Braga (2013). Again, the coefficients of both variables representing imported inflation were very close in the case of model 11, which inserts them in current time, and model 12, which inserts them with 1 lag.

As for demand indicators, the GDP gap and the IBC were significant in 4 of the 5 models presented. The impact of these variables on the inflation rate was positive - following the logic that the greater the difference between observed output and potential output, the higher the inflation rate - while the impact on the change in labor costs was negative.

Figure 6 presents the IRF plots of model 9 with PNAD data, which showed better graphical results. The result indicates that an impulse of the labor cost component (dRemProd1) has a positive and statistically different impact from zero on price inflation (dIpcaGeneral) - thus following the result of model 7, with the difference that in the case of model 9 the impact is more distinct further in advance, from the fifth month onwards. Another interesting result indicated by model 9 is the positive and significant response of labor cost variation to a boost in price inflation, indicating the existence of a long-term relationship between them.

Finally, the **Table 4** presents the result of the Portmanteau test to assess the presence of serial autocorrelation of the residuals of each model. For all models the tests suggest non-rejection of the null hypothesis of absence of autocorrelation of the residuals considering a 5% significance level.

Table 3: Summary of VEC models estimated with PNAD data - part 2

Endogenous: First seasonal difference of the General IPCA (dIpcaGeneral) and the Nominal Average Income discounted from a Productivity index (dRemProd1 or dRemProd2)
Sample: Mar/2013 to Jan/2022

Identifier	Model 8	Model 9	Model 10	Model 11	Model 12	Signif. (at 5%)	Signal
Gaps	2	2	3	3	3		
Results equation dIpcaGeneral							
ECT	-0.036**	-0.04**	-0.026**	-0.004	-0.004	3	5(-)
dIpcaGeneral -1	0.411***	0.428***	0.404***	0.456***	0.486***	5	5(+)
dIpcaGeneral -2	-0.219*	-0.219*	-0.226*	-0.222.	-0.203.	3	5(-)
dIpcaGeneral -3			0.046	0.072	0.087	0	3(+)
dRemProd1 -1	0.018	0.019				0	2(+)
dRemProd1 -2	-0.011	-0.016				0	2(-)
dRemProd1 -3						0	
dRemProd2 -1			0.004	0.012	0.014	0	3(+)
dRemProd2 -2			-0.019	-0.015	-0.016	0	3(-)
dRemProd2 -3			-0.015	-0.012	-0.011	0	3(-)
dIcBcb	0.014***		0.014***			2	2(+)
dIcFmi				0.006*		1	1(+)
dExchange				0.008**		1	1(+)
dIcBcb -1		0.014***				1	1(+)
dIcFmi -1					0.004	0	1(+)
dExchange -1					0.008*	1	1(+)
GDP gap	0.024*	0.024*				2	2(+)
HiatoIbc			0.024*		0.018	1	2(+)

GapIbcAdjustment				0.038*		1	1(+)
Results equation dRemProd							
ECT	0.276**	0.352**	0.275***	0.186***	0.196***	5	5(+)
dIpcaGeneral -1	0.8	0.771	0.801	0.19	0.305	0	5(+)
dIpcaGeneral -2	1.306.	1.308.	0.663	0.411	0.474	0	5(+)
dIpcaGeneral -3			2.454**	2.18**	2.299**	3	3(+)
dRemProd1 -1	-0.215*	-0.212*				2	2(-)
dRemProd1 -2	-0.128	-0.104				0	2(-)
dRemProd1 -3						0	
dRemProd2 -1			-0.155	-0.052	-0.138	0	3(-)
dRemProd2 -2			-0.094	-0.005	-0.046	0	3(-)
dRemProd2 -3			0.017	0.093	0.047	0	3(+)
dIcBcb	-0.06*		-0.1***			2	2(-)
dIcFmi				-0.077***		1	1(-)
dExchange				-0.085***		1	1(-)
dIcBcb -1		-0.067**				1	1(-)
dIcFmi -1					-0.063**	1	1(-)
dExchange -1					-0.097***	1	1(-)
GDP gap	-0.161.	-0.163.				0	2(-)
HiatoIbc			-0.243**		-0.235**	2	2(-)
GapIbcAdjustment				-0.31*		1	1(-)

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Figure 6: FIR plots of model 9 with PNAD data

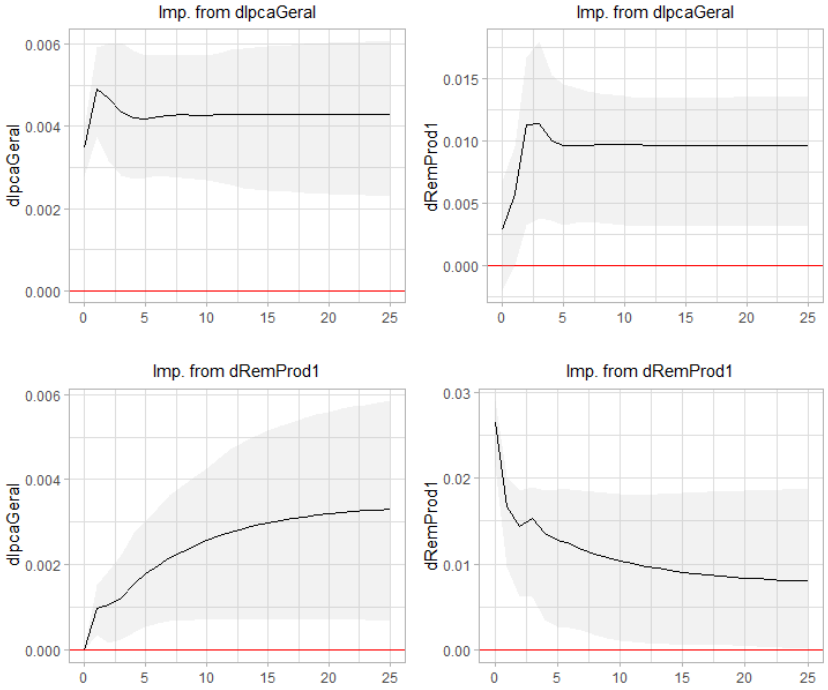


Table 4 Results of the test for serial autocorrelation of residuals

Model	P-value of the test of Portmanteau
1	0.0582
2	0.0718
3	0.0694
4	0.0716
5	0.0785
6	0.0518
7	0.0577
8	0.0907
9	0.0518
10	0.1778
11	0.0901
12	0.1071

3.3.3 Complementary model

The construction of VEC models previously shown assumes a long-term relationship only between the endogenous components of the model. Nevertheless, in order to analyze the possibility of a long-term relationship between these endogenous variables (price and wage inflation) and the components of imported inflation or demand pressures, we opted to present a complementary VEC model, which differs from the models in the previous section by having as endogenous variables, in addition to price and wage inflation, an imported inflation component (IC-Br) and a demand pressure component (GDP gap). In addition, two *dummies* were inserted to deal with phenomena that caused serial autocorrelation of the residuals[9]. The results are presented in **Table 5**.

The IRF plots of the complementary model, shown in **Figure 7**, show that in the face of an impact on the variation of the BCB Commodity Index (dIcBcb), there is a positive and statistically significant reaction of price inflation (dIpcaGeneral), suggesting a long-term relationship between these two variables. On the other hand, it was not possible to identify a long-term relationship between the demand index and IPCA inflation. Finally, **Table 6 Table 6**provides the result of the Portmanteau test for the residuals of the complementary model, which does not reject the null hypothesis of no correlation of the residuals.

[9] The first (dummy_RemCov) controls for the statistical effect of an increase in average compensation between the months of May and July 2020, due to the exit of many workers in the labor force. The second (dummy_HiatoCov) controls for a sharp drop in the GDP gap variable at the time of the COVID-19 crisis.

Table 5: Result of the complementary VEC model

Endogenous: First seasonal difference of the General IPCA (dIpcaGeneral), the Nominal Average Income (dRemTrab), the IC-Br (dIcBcb) and the seasonally adjusted GDP gap (HiatoPibAdjustment).
Sample: Mar/2013 to Jan/2022
Lags: 3

	Equation dIpcaGeneral	Equation dRemTrab	Equation dIcBcb	Equation GapGDPAdjustment
ECT	-0.193**	0.017***	-0.016*	-0.016*
dIpcaGeneral -1	1.972	0.345**	-0.269	-0.269
dIpcaGeneral -2	1.485	-0.272*	0	0
dIpcaGeneral -3	0.225	0.005	0.19	0.19
dRemTrab -1	1.423.	0.019	0.142	0.142
dRemTrab -2	-0.685	-0.037	0.197.	0.197.
dRemTrab -3	-0.084	-0.035	-0.103	-0.103
dIcBcb -1	0.398***	0.012	0.022	0.022
dIcBcb -2	-0.232*	-0.01	0.013	0.013
dIcBcb -3	0.149	0.002	0.014	0.014
GapGDPAdjustment -1	-0.13	-0.054*	-0.014	-0.014
GapPibAdjustment -2	0.587.	0	-0.004	-0.004
GapPibAdjustment -3	-0.132	-0.014	-0.096*	-0.096*
dummy_RemCov	0.013	-0.005.	0.007.	0.007.
dummy_HiatoCov	0.068**	0	0	0

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Figure 7: IRF plot of the complementary model for the impact of the change in the IC-Br and the GDP gap on IPCA inflation.

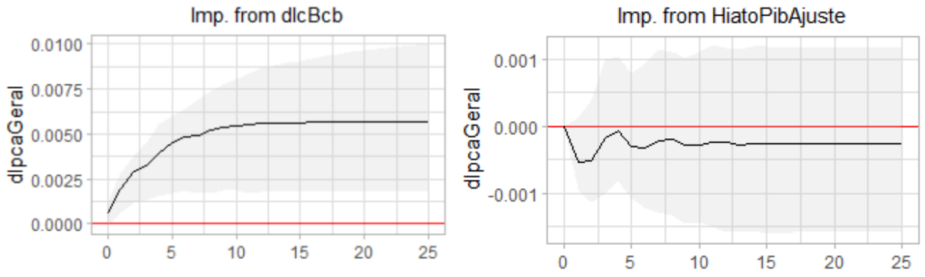


Table 6: Result of the test of serial autocorrelation of residuals for the complementary model.

	P-value of Portmanteau test
Complementary model	0.0656

CONCLUSION

This paper aims to evaluate the behavior of Brazilian inflation after the adoption of the Inflation Targeting Regime and to identify its main determinants, focusing on the role of distributional conflict in the inflationary process. An econometric analysis of inflationary dynamics in Brazil is developed by estimating Phillips curves that incorporate cost and demand elements to identify which variable exerted the greatest influence on inflation as measured by the overall IPCA. Although different types of indicators are included, the focus of analysis of the models employed is the relationship between price and wage inflation, with the latter component being measured with data from the Monthly PNAD. The estimation was performed with VEC models whose endogenous variables were price inflation and wage inflation, while a combination of variables representing the other sources of inflationary pressures were used as exogenous variables.

The results of the main models suggest the existence of a long-term relationship between wage inflation and price inflation in Brazil, since a boost in the wage inflation component generates a positive response of price inflation measured by the IPCA. It was also possible to identify a positive and significant reaction of the wage component to a boost in price inflation. Among the exogenous variables, we found that: (i) imported inflation was statistically significant for price inflation in all main models; and (ii) the impact of demand indicators on price inflation was not statistically significant in most models.

A complementary VEC model was estimated, which includes in the vector of endogenous variables components of imported inflation and demand pressure, in addition to price and wage inflation. The result of this model suggests the existence of a long-term relationship for the impact of imported inflation on Brazilian price inflation, while the impact of the demand indicator on the variation of the IPCA was not statistically significant.

In addition, the descriptive analysis of inflation in Brazil, conducted in the second section, argues that the main drivers of inflationary pressures in the country after the adoption of the ITR were: (i) imported inflation and exchange rate policy; (ii) administrative inflation; and (iii) wage inflation and distributional conflict. In this sense, the empirical analyses conducted in this paper, both descriptive and quantitative, corroborate the hypothesis that Brazilian inflation in the period studied is mostly caused by cost pressures. This result is in line with the argument supported by post-Keynesian theory, that cost pressures play a leading role in explaining inflationary dynamics.

As for the econometric analysis, it contributed to the empirical literature by focusing on the study of the relationship between prices and wages, including the wage component in the inflation analysis. Among the possible outcomes of the research, two main ones stand out: (i) the need to deepen the investigation proposed by the complementary model in future studies; and (ii) the possibility of developing an econometric analysis similar to that of the third section, but in a sectoral way, using the IPCA and the disaggregated wage component.

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