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## **Abstract**

From the late 1940s on, the so-called Latin American Structuralist School or the Economic Commission for Latin America (ECLA) School developed the idea that Latin American inflation was related to structural characteristics of that region, especially the recurring problems in the balance of payments due to low diversification of production and exports and to the behavior of world trade. This paper examines the structuralist hypothesis in the Brazilian case. For this purpose, it develops a historical analysis of the 1951-1985 period and carries out a number of econometric tests to support it. Both the historical analysis and the econometric tests show that the structuralist hypothesis should not be refused in the Brazilian case.

**Key words:** Structuralist school; Brazil; inflation; external shocks.

**JEL Classification:** N16

## **Resumo**

A Escola Estruturalista Latino Americana – ou Escola da Comissão Econômica para América Latina (Cepal) – desenvolveu, desde os anos 1940, a teoria que as altas taxas de inflação na América Latina se deviam a problemas estruturais da região. Dentre estes problemas estruturais, um dos mais importantes era os recorrentes problemas de balanço de pagamentos devidos à baixa diversidade produtiva e exportadora e ao comportamento do comércio internacional. O presente trabalho examina a hipótese estruturalista para o caso brasileiro a partir de uma análise histórica do período 1951-85 e de testes econométricos. Neste contexto, em ambos os casos, a evidência encontrada no artigo mostra que a hipótese dos estruturalistas não deve ser rejeitada para o caso brasileiro.

**Palavras chave:** Escola estruturalista; Brasil; inflação; choques externos.

# External structural imbalances and Brazilian chronic inflation during the second half of the 20th Century

## Introduction

In the second half of the 20th century, most Latin American countries suffered from chronic inflation, and so a huge debate on the causes of that problem took place in those countries. One obvious interpretation was the orthodox view that the inflationary process was the result of excess demand due to lax fiscal and monetary policies. This traditional point of view – usually known as monetarist - was supported by many economists within those countries and by international institutions such as the International Monetary Fund (IMF).

From the late 1940s on, this traditional interpretation was challenged by an alternative view developed by economists associated with the so called Latin American Structuralist School or the Economic Commission for Latin America (ECLA) School.

The greatest contribution of the ECLA School to the study of Latin American development has been defining the external constraint as the crucial analytical element. So, since the pioneering work of ECLA's *founding father* Raul Prebisch (ECLA, 1950), Latin American development problems have been seen as the result of import capacity restraints stemming from the tendency towards the deterioration of terms of trade and unfavorable income elasticities of imports and exports. As for the causes of inflation, the external constraint was once again at the core of the structuralist interpretation (Noyola-Vasquez, 1957; Sunkel, 1958). More precisely, ECLA's economists argued that the process of chronic inflation experienced by Latin American economies was fundamentally caused by structural characteristics of the region, among which the crucial external shocks due to recurring crisis in the balance of payments.

This paper intends to study the causes of inflation in Brazil from 1951 to 1985, a period when Brazilian inflation rates were among the highest in the world. More precisely, its purpose is to test whether or not the structuralist theory of inflation fits the Brazilian data. Particularly that was a period when several episodes of external crisis were registered, or at least when the external financing conditions deteriorated, while the domestic

institutional setting of monetary and fiscal policy changed quite radically. It is not the aim of the paper to establish a complete model of inflation and test it for the whole period covered by the historical analysis. However, it might provide supporting evidence to the structuralist analysis if it is able to show that it cannot be denied that there exists a strong connection between external shocks and inflationary upsurges throughout a long historical period when, as mentioned, fiscal and monetary policies varied substantially.

The paper is divided into three sections, in addition to this introduction and the conclusions. The first one consists of a theoretical discussion, in which the Latin American structuralist theory of inflation will be presented. The second one contains a historical analysis directed to describe a long term narrative that supports the structuralist hypothesis. In this particular section, all the episodes of inflation upsurge from 1951 to 1985 are analyzed with a view to verify whether they had been preceded by some kind of external shock, being it exchange rate devaluations or commodity price shocks. Finally, the third section presents the econometric tests. In particular, a VAR model with exogenous variables is estimated and a Granger causality test is calculated, in order to give further evidence on whether or not one can refuse the structuralist hypothesis in the Brazilian case.

# I An overview of cost-push models - The Latin American Tradition

In this section we will firstly present a brief summary of what one may call the *Latin American tradition of cost-push models*. Secondly, we will describe the connections between exchange rate devaluations and inflation. By the latter, we mean a group of explanations for inflation developed by Latin American authors aiming at explaining the experience of Latin America. Those explanations follow the non-monetarist tradition that could be traced back to Thomas Tooke's explanation for the British inflation during the Napoleon Wars and the *German Interpretation* of Germany's 1920s hyperinflation, which contrasted with the diagnosis produced by the allies (a monetarist one).<sup>1</sup> The Latin American cost-push models analyze inflationary historical episodes focusing on the dynamic of some basic elements of costs instead of mismatches between full-capacity production and demand. The basic ideas were, broadly speaking, developed around the ECLA's circle in Santiago, Chile.

The seminal paper that marks the beginning of the so-called ECLA School is the *Estudio Econômico de America Latina* written by Dr. Raul Prebisch in 1949. This paper - an authentic watershed in theoretical terms - was followed by a strong body of works, whose most important consequence was providing the support to Import Substitution policies carried out by almost all Latin American countries. Although those policies became almost the trademark of the ECLA School in Latin America, this institution had also some interesting things to say about inflation.

Prebisch is said to have drawn from his experience as president of the Central Bank of Argentina the conclusion that "...the control of the inflation in our countries demands specific diagnosis for each case and not the adoption tout court of measures related with money and credit expansion." (Gamboa 1978, pp. 9). This is a basic and important characteristic of the Latin American structuralist interpretation: the notion that inflation is a particular phenomenon and thus it has to be studied according to the particular

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<sup>1</sup> See Arnon (1991) for Tooke's main ideas. On the debate on the 1920s hyperinflation episodes see Bastos (2002) and Franco (1986).

institutional and historical setting of each country. In other words, it has to be studied according to its structural components.

In search for *structural* factors, several authors examined the causes of inflation as supply elements, or factors influencing cost formation. The latter follows precisely the theoretical approach that we think provides a good explanation for the Brazilian inflationary experience<sup>2</sup>. Moreover, consistently with ECLA's general approach sketched above, several structural factors that explain inflation also play an important role on the analysis of problems or barriers to economic development. Two main sets of arguments can be presented, as follows.

Firstly, there was the idea of imbalances that stem from rapid economic growth. Despite the fact that *imbalanced growth* could have positive dynamic properties, as Albert Hirschman stressed in his work, it might create some sectoral imbalances resulting in eventual cost pressures even when the economy operates below full employment. The analysis of this type of sectoral imbalance has great relevance within the structuralist tradition. The paper written by Olivera (1964) limits the structuralist interpretation within these rather strict boundaries, meaning that the approach should basically refer to structural imbalances and rigidities on specific economic sectors. What structuralist authors and particularly Olivera (1964) argue is that Latin America economies were likely to present sustained inflation, which would be well described by the following structural reason, namely the growth process that characterizes developing countries.

An example of specific sectoral imbalance that has been repeatedly singled out by structuralist authors as the most important is the agricultural bottleneck, especially the production of foodstuff directed to internal consumption. If one takes into consideration that foodstuff is a sizable portion of workers' real wage<sup>3</sup>, workers would be expected to have their wages indexed to the variation of food prices. Therefore the mechanism of wage indexation would transmit this initial cost push to the rest of the economy (including industries whose inputs do not include agricultural products). Of course that idea has had

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<sup>2</sup> It is important to acknowledge though that the works of structuralist authors mixed up strictly supply factors with demand issues as "structural" causes for inflation. See for example Sunkel (1958 p. 574), where an alleged chronic savings deficiency is meant to be a persistent explanation for inflation in Chile.

<sup>3</sup> The backwardness of Latin American countries implied that the share of foodstuff in Latin American workers' consumption basket was high when compared to the more developed countries workers'.

a decreasing importance as agriculture in Latin America advanced in terms of productivity in almost every country; on the other hand, the relation between commodity prices and internal inflation has got even stronger as modernized agriculture became fully integrated into world markets, and international prices have had a direct effect on domestic food prices and agricultural inputs prices. This mechanism gives the international commodity prices in local currency - multiplied by the exchange rate - a strong influence on internal inflation.

A second and for our purposes more relevant point of view raised by the structuralist authors focuses the relationship between external conditions and inflation. Latin American economies face persistent deficits on the current account due to low diversification of production and concentration in resource based exports, which result in high income elasticity of imports and low export growth - besides a tendency towards the deterioration of terms of trade. Therefore, the deterioration of external trade conditions not matched by increased external financing (and unfortunately for the periphery trade and financing crisis are usually two faces of the same coin) will cause recurring exchange rate devaluations. This instability and recurrent crisis would trigger an exchange rate-nominal wage spiral, and the structural external imbalances would make it very difficult to stop this process by adopting some sort of fixed nominal exchange rate policy.

Even though several Latin American authors stressed the connection between external conditions and inflation, it was a British economist, namely Nicholas Kaldor (1978), who presented this question in a very systematic and organized manner. As a consequence of the persistent pressure on the import capacity of certain countries, Kaldor divided the latter in two types: the inflationary ones (the ones that show this tendency) and the non inflationary. Therefore there is an endogenous cause for persistent exchange rate devaluation. The combination of exchange rate devaluations and some degree of distribution conflict explains the recurrence and persistence of inflationary episodes in the continent.

Pazos (1972) developed an interesting analysis within the structuralist approach discussed in this subsection. Even though he affirms that inflation is a multi-factor process, in several passages of his book, for example, he does not support the idea that there is a persistent relationship between an acceleration of economic growth and inflation. In fact, due to the very nature of chronic inflation the aceleracionist idea that is present in the



monetarist model is dismissed by Pazos. On the contrary, he argues that the causality usually runs in the opposite direction by showing that the distortions induced in the economic system by persistent (and high) inflation are elements that usually “discourage production and hinder economic growth” (Pazos 1972: 37). He also uses the concept of economies and diseconomies of scale as an argument to support his criticism to the usual direction of causation<sup>45</sup>.

However, Pazos’ most important contribution is the idea of *inertial* inflation – a concept that was later associated with authors that became highly influential in policy prescriptions during the 1980s, mainly in Brazil.<sup>6</sup>

Even though the wage and administered prices mechanism that explain inflation inertia deals clearly with the dynamic of cost elements, it is also true that the existence of such inertia indicates some degree of equilibrium, or the absence of an external force that accelerates the rate of inflation. This distinction is useful to briefly discuss the distinction between stable and high (and accelerating, or highly unstable) inflation.

According to Pazos’ “rapid accelerations are usually associated with foreign currency crisis” (Pazos 1972: 136). As for that, one may ask: what happens after an exchange rate devaluation?

If it is a once and for all movement, there would be an inflation spike that gradually subsides and eventually brings a lower wage rate and a devalued real exchange rate than the initial value. However, as it is the case of Latin American economies, a devaluation

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<sup>4</sup> When criticizing contractionary policies he says: “When aggregate demand increases proportionately less than the inertial rise in costs, enterprises restrict sales and output rather than permit a reduction in their profits per unit of output by raising prices less than costs. As sales go down, costs per unit of output go up, thus giving a further push to prices” (Pazos 1972: 135).

<sup>5</sup> Based on the empirical evidence from 1950 and 1970, Pazos (1972) also suggested that investment levels are not directly correlated with inflation in any sense: “It is clear that the figures on fixed investment ... do not correlate closely with the rates of inflation; hence they do not support the ideas most frequently held regarding the relationship between the two series. Neither do the figures substantiate the theory that inflation facilitates the financing of a high-level volume of investment by forcing up savings, nor the idea that it keeps investment down discouraging voluntary savings.” (Pazos 1972: 41).

<sup>6</sup> The first stabilization program to openly use the concept of inertial inflation in Brazil was the Cruzado Plan. After that every plan implemented in Brazil adopted some formula to bring wages to their previous real value (or its average over a specific period of time) and some mechanism to eliminate the inertial component.

of the exchange rate is the consequence of serious international crisis, low export elasticity of demand, high import elasticity of imports, and deteriorated terms of trade, which would imply, or require, several nominal devaluations of the exchange rate until the new real exchange rate settles in an *equilibrium value*, with the real wage bearing the burden for the change in external conditions.

However, it is highly unlikely that the resulting fall of wages and other changes in internal distributive variables would be met without any kind of resistance. Both nominal wages and nominal interest rates usually react to the increase of the exchange rate, setting in motion several rounds of nominal increases of all relevant distributive variables. If there is no accommodation, or if wage resistance were so strong that workers could increase nominal wage by the same rate of other distributive variables, then a hyperinflation would occur. This highly unstable case is not of interest for most practical cases, and specifically not for our study. What happened in real historical cases, or what the exchange rate devaluation triggers, is a sequence of nominal increases that at some point start to converge to some nominal *stable* variation rates, corresponding to real, or average, values for the relevant distributive variables, e.g., real exchange rate, real wage and real margin of profit (Bastos, 2002).

This is exactly what we are going to develop in this paper, first in a highly schematic way by means of a brief review of the inflation process from 1951 to 1985 and finally by applying quantitative methods to test our basic hypothesis in section 3.

## **II Exchange rate devaluation and inflation upsurge in Brazil, 1951-1985**

### **II.1 – Overview**

The aim of this section is to analyze Brazilian historical data and determine the potential connections that might exist between external shocks and episodes of inflation upsurge. Episodes of inflation upsurge are characterized by situations where the inflation rate (accumulated in 12 months) starts a period of several months (more than six months) of continuous or almost continuous rise, resulting in a rate of inflation (accumulated in 12 months) at least 50% higher than its initial value. External shocks correspond to a period of successive nominal exchange rate devaluations, a maxi-devaluation and/or a commodity price shock. The goal here is to identify episodes of inflation upsurge and to analyze whether or not these episodes were preceded by or concurrent to some kind of external shock.

Our analysis starts in the post Second World War, when a rapid industrialization process was already underway since the early 1930s. As Furtado (1965) wrote in “The Economic Growth of Brazil”, in the 1930s there was in Brazil a definitive "displacement of the economy's dynamic center" from export-gearred agricultural activities to domestic market activities. In that decade marked by a huge scarcity of foreign currency, limited import capacity pushed for industrialization and urbanization processes to be supported by the (poorly efficient) previous productive capacity and by imports of used equipment from countries in recession, as well as by indigenous supply of capital goods in its low-efficiency infant stage of production – all of them acting as constraints that should probably have increased throughout the war. This resulted in a generalized claim for infrastructure investment among entrepreneurs and government officials.

By the end of the war and for a couple of years there was a widespread hope that the international market would quickly start to operate normally under the rules of the Bretton Woods system. Brazilian policy-makers were then confident that the foreign exchange reserves accumulated during the war, the export expansion prospects and the support of the United States to their Latin American war allies would allow for the implementation of large infrastructure projects. This would soon prove to be an exceedingly optimistic bet and was replaced by a growing frustration related to the dollar shortage and the North

American emphasis on the reconstruction of Europe and Japan, regardless of Latin American and Brazilian needs. “Economic Reequipment” was the expression obsessively used for many years to refer to infrastructure requirements as evidenced by the name of the newly created fund that provided the capital for the installation of the Banco Nacional do Desenvolvimento (National Development Bank – BNDE) in 1952: “Fund for Economic Reequipment”.

Our analysis in this section starts in 1951, a period of internal and external changes, and ends in 1985, when once again important changes were happening both internally and externally. It starts in 1951 because during Eurico Dutra’s presidency (1946-51) the nominal exchange rate was kept fixed and there was no major external shock. It ends in 1985 because from this year on several (failed) stabilization plans were attempted, which caused too many structural breaks in the data and lead to a situation of a near-hyperinflation by the end of the 1980s. The data pertaining to that period are not at all reliable and it is hard to identify any causal relationship between variables, especially when it comes to econometric studies as the one we will develop in section 3.

## **II.2 – Historical Record (1951-1985): seven out of eight episodes of inflation upsurge were preceded by or concurrent to external shocks**

The data analysis shows that from 1951 to 1985 there were eight episodes of inflation upsurge, among which seven were preceded by or concurrent to some kind of external shock. This evidence shows that we cannot refuse the hypothesis that inflation upsurge in Brazil is strongly related to difficulties in the external sector<sup>7</sup>.

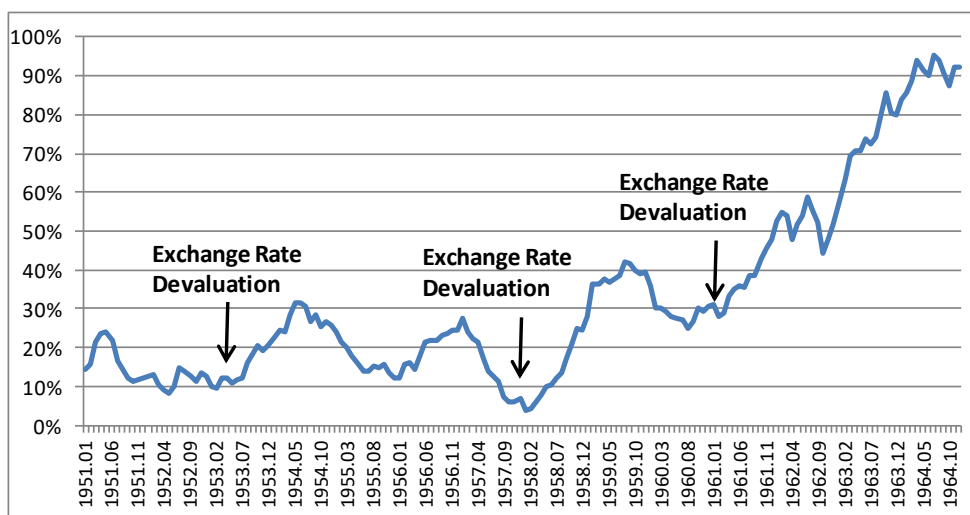
A first phase can be identified in the period running from 1951 until 1964, which was all along one of scarce foreign currency availability. The increase of coffee prices (Brazil’s most important exports good at that time) between 1949 and 1954 and large direct foreign investment in the second half of the decade alleviated the dollar shortage, but the fast economic growth until 1962 and poor access to finance throughout the whole period resulted in continuous pressure on nominal exchange rates, and thereby on inflation. Throughout this period there were four episodes of inflation upsurge. Three out of them

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<sup>7</sup>For a complete list of the inflation upsurge episodes, see Annex 1.

were preceded by some sort of external shock (see figure 1). The sole exception was the episode of 1955-56<sup>8</sup>.

**Figure 1 – External Shocks and Inflation Upsurge (1951-1964)**



Source: author's elaboration from Ipeadata.

The **first episode** took place between July 1953 and May 1954 (lowest inflation rate 12%, highest 32%) and it was caused by the 103% maxi-devaluation of February 1953, which was then reinforced by the establishment of a multiple exchange rate system in October of the same year<sup>9</sup>. This devaluation was the lasting result of a long period in which the exchange rate was kept fixed and overvalued: shortly after World War II, the nominal exchange rate was fixed in an appreciated level in real terms and was not changed throughout Eurico Dutra's government (1946-51). As previously noted, that was a period of dollar shortage, when even orthodox economists in Brazil agreed that a fixed exchange rate combined with government managed import licensing should prevail in order to

<sup>8</sup> The exchange rate devaluations for the entire 1951-1985 period were calculated based on the monthly change (%) of the average nominal exchange rate. This choice was due to Brazil having multiple exchange rates during the whole 1950s. The inflation rate used as a reference was the IGPDI (*Índice Geral de Preços*, or General Price Index) 12 months accumulated inflation rate. The IGPDI was the most important inflation index in Brazil after the World War II.

<sup>9</sup> Shortly after the adoption of the multiple exchange rates regime, a 38% maxi-devaluation in the average nominal exchange rate was registered in December 1953.

prevent large crises in the balance of payment (cf. Bielschowsky, 2004, pp. 49-50 and p.312).

In 1951, Getúlio Vargas second term (1951-54) started with the Finance Minister, Horácio Lafer, attempting to bring inflation rates down, so that the exchange rate was not devalued and the import licensing system was relaxed. The combination of a less protectionist system and an appreciated real exchange rate resulted in a boom in imports, so that the international reserves in convertible currency fell sharply. From this point on, the government tried to restore the former import licensing requirements, but the currency shortage could not be overcome (Vianna, 1990: 126-28).

After so long a process of real appreciation and amid a balance of payments crisis, the devaluation of nominal exchange rate became inevitable. In early 1953, there was a huge devaluation and the exchange rate system was changed first with the Law 1807 of March 1953, which practically instituted a multiple exchange rate system (Vianna, 1990: 134). The system was changed again in October 1953 when the Instruction 70 of the *Superintendência da Moeda e do Crédito* (Money and Credit Superintendency, SUMOC)<sup>10</sup> officially launched multiple exchange rates<sup>11</sup>.

In **Episode 2**, between April 1956 and January 1957 (lowest rate, 14%; highest, 28%), no clear evidence could be found that suggested a relationship between external shock and inflation. As previously noticed this is the only episode in the period studied in which this relationship is not observed.

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<sup>10</sup> At that time, Brazil had no Central Bank and the monetary authority duties were performed by two institutions: Sumoc and *Banco do Brasil* (Bank of Brazil). In general, Sumoc acted as a normative body, while the Bank of Brazil had the role of implementing the policies and norms.

<sup>11</sup> According to this Instruction, exporters would receive the official rate (Cr\$ 18,50/ US\$) plus a bonus of Cr\$5/US\$ in the case of coffee exports and of Cr\$10/US\$ in the case of the other exports. As for the imports, there were three different exchange rates depending on the imported good: 1) official exchange rate (without surcharge) for special imports such as wheat and newsprint; 2) official exchange rate plus a fixed surcharge for oil and direct imports of the federal, state and county governments; 3) official exchange rate plus a variable surcharge for the other imports being the level of these variable surcharges defined in auctions in which the imports belonging to the third group were divided into five different categories according to a criteria essentiality established by the government (Vianna, 1990: 139-41).

The **third Episode** of inflation upsurge preceded by external shock started in February 1958 and ended in August 1959 (lowest rate, 4%; highest rate, 42%). Devaluations took place in the second semester of 1957 and were likely to have been due to the changes in the exchange rate system caused by the Law 3244, which reduced from five to two the number of categories under the variable surcharge rule. The new rules were set in August 1957 and the devaluation in the average nominal exchange rate started from this point on. There was a 40% devaluation of the average nominal exchange rate from July 1957 to February 1958, which was followed by a further 26% nominal devaluation from March 1958 to May 1958. There was altogether a total of 83% nominal devaluation from July 1957 to May 1958.

This was all along a period of growing difficulties in the balance of payments due to a 33% fall in the international price of coffee (average import price in the United States) from 1954 to 1958 (Bacha & Greenhill, 1992). In spite of large inflows of Direct Foreign Investment, fast import growth due to the rapid industrialization process led to increasing current account deficits.

In **Episode 4** (from February 1961 to April 1964, lowest inflation rate at 28% and highest at 94%) inflation upsurge was also due to an external shock. This time the causes were the 51% nominal exchange rate devaluation (from December 1960 to April 1961) and the reduction in the imports subsidies (for oil and wheat) in the first months of the year. According to Malan (1981), those measures had an immediate impact on inflation rates, so that wholesale prices grew 15.5% in the first semester (Malan, 1981: 94). Moreover, it is also worth mentioning that the multiple exchange rate system was further dismantled throughout 1961 by a series of “measures that brought greater unity to the foreign exchange system” (Baer, 2001: 58).

After inflation slowed down a bit for a very short period in mid-1962, rates accelerated again in November 1962 following a devaluation in the exchange rate of 30% that occurred from July 1962 to October 1962, which was again reinforced by another devaluation in the first semester of 1963. At this time the country was experiencing a period of political unrest and economic crisis. Given that annual inflation rates were around 50%, the cost shocks due to the exchange rate devaluation triggered a wage-price spiral, enhanced by the political difficulties that João Goulart’s presidency was facing. On the one hand, the president did not have the support of US authorities to get into the

funds to face debt payments in the short run. On the other hand, his connections with the labor movement did not leave him many degrees of freedom to impose restrictive wage policies, nor to adopt other contractionary policies. Such a turbulent chain of events led to the military *coup d'état* of April 1964 and to annual inflation rates reaching 90% by then.

The dictatorship implemented in 1964 faced much better international conditions and the 1964-73 period was one of abundant foreign currency. At the climax of the so-called *golden age of capitalism*, fast export growth and unprecedented access to booming international finance availability allowed for low pressure on the exchange rate and relatively low inflation rates – especially from 1968 to 1973 - in a scenario of fast economic growth. Furthermore, the military regime had the support of the US government, which allowed for the renegotiation of the external debt conditions that helped the country to get access to more external funds. For example, Brazil was the fourth largest receiver of funds from AID from 1964-67, only behind India, Pakistan and South Vietnam (Lara Resende, 1982, p. 782-783). Under these favorable external conditions, it was not surprising that the adjustment program launched by the authoritarian government in 1964 - the so-called *Programa de Ação Econômica do Governo* (Government's Economic Action Programme, PAEG) - was successful in bringing inflation rates down. From 1967-8 until 1973, inflation rates were around 15-20%, a reasonably low level for Brazilian standards at that time.

It is worth mentioning that in the beginning the PAEG's strategy included the devaluation of the exchange rate, which was supposed to correct a long-time overvalued exchange rate. It is nonetheless also important to point out that PAEG's policy-makers feared an exchange rate-prices-nominal wages spiral due to this cost push shock. Therefore, they introduced a regressive wage rule that caused a huge real wage fall in the following years. This policy was intended to bring down inflation stepwise using an ingenious wage indexation scheme. Wages were adjusted to their past two-year average plus the expected future rate of inflation. If the expected inflation and the actual one were exactly equal this indexation scheme would have been able to bring inflation down without real wage losses. However this was not the case, due to several reasons such as, for example, a deliberate increase in administered public prices intended to reinforce public enterprises revenues.

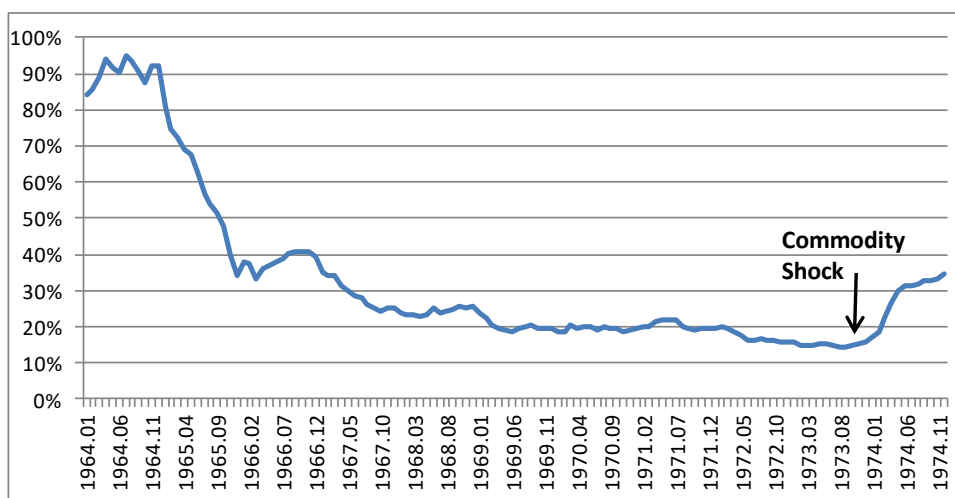


Therefore, inflation was brought down by controlling nominal wages, or sub-indexing them, combining lower inflation and real wages.

In 1967 the government established a crawling peg regime with two basic purposes. First, it was intended to establish a competitive real exchange rate. Second, it aimed at smoothing out the international capital flows that at that moment were beginning to pick up with the development of the international “Eurodollars” market. The shortening of the exchange rate indexation lag could have affected positively the rate of inflation in the period, but the aforementioned sub-indexation of nominal wages damped the price/wages spiral.

Figure 2 shows inflation rates falling during the 1964-73 period until the 1973 First Oil Shock. Brazil had to import most of its oil, so that the oil prices hike meant a major cost shock. The government’s decision not to halt economic growth by pursuing restrictive monetary or fiscal policies made it worse. The First Oil Shock was a turning point in the international economic conditions for countries like Brazil.

**Figure 2 – External Shocks and Inflation Upsurge (1964-74)**



Source: author’s elaboration from Ipeadata.

In this new scenario, inflation rates grew rapidly in 1974 and thus lead to the **fifth episode** of inflation upsurge: there was an increase in the rate of inflation accumulated in 12 months from 15% in November 1973 to 35% in December 1974. According to Serra (1982) commodity prices pushed internal basic costs. This situation was aggravated by the oil shock that was already in its way in the second semester of 1973. It should also be pointed out that in 1974 nominal wage indexation rule changed and added an extra cost

element to push up inflation rates. The previous rule of nominal adjustment, based on the two previous years' averages, was changed for one-year only. In a period when inflation was accelerating this measure represented a nominal upward push on wages and consequently on prices.

**Episode 6** started by the end of 1975. The following 12 months accumulated inflation rate moved slightly upward around 25-30% to a new *plateau* close to 50% (see Figure 3), as observed by Belluzzo and Coutinho (1982, p. 160-161). Once again the explanation for this episode is a cost-push element associated with the foreign sector, namely the imposition of a compulsory deposit of 100% for 360 days in every import purchase. One might call it *effective* nominal exchange rate devaluation (Bastos, 2002). In terms of the impact on import prices, it had a similar effect of an exchange rate devaluation but without the negative consequences on capital flows, which the country was in dire need in this period. Apart from this change, other sources of cost-push inflation were relatively stable during these years. The exchange rate kept its crawling peg pattern and there was no change in the wage indexation policy. In brief, what seems most likely is that a change in *inflation plateau* occurred by means of a shock transmitted to the whole economy by means of indexation mechanisms, with the establishment of a higher "stable" inflationary level.

In 1979, Brazil suffered simultaneous shocks: second oil shock, devaluation of the exchange rate, and shortening of wage indexation. More importantly, there was a further change for worse in the international economic environment that would set new parameters for all Latin American economies in the next decade.

This gave rise to the **seventh episode**, in which inflation raised from 45% to 121% between June 1979 and March 1981. The first important exogenous shock was the 110% increase in international oil prices that took place from June 1979 to February 1980. It is interesting to notice that such a price hike was not as sharp as the previous one registered in 1973, but it had a greater impact in Brazil. In 1974 domestic prices of oil products (gas and motor oils) raised 65.7%, while external prices increased 257.32%. In 1979, they increased 160.1% and 110%, respectively. This difference is explained by the strong subsidies to oil prices that existed at the time of the first shock.

The increase in international interest rates also put new external pressure on Brazil's economy, as it made the international capital market less prone to lend money to Latin American countries, which were already indebted and also faced renewed problems in current transactions. This lower enthusiasm regarding lending pushed to an increase in spread values (over the increasing base interest rates) and the shortening of loan terms. The combination of such elements resulted in a *snowball type* of indebtedness with strong negative impacts over the external balance. In such a difficult external situation, it was not possible to avoid a stronger internal impact from the external shock, as it had been the case five years before. The economic authorities, in an attempt to cope with the critical

external situation, devalued the exchange rate by around 28% in December 1979, which was an extra cost shock and put greater inflationary pressure on the economy.

At the same time, a change was made to the nominal wage adjustment rule. The new policy established by the Law n° 6.708 of September 30, 1979, was not designed to maintain the real wage (as the previous one), or the average wage obtained in a past period, but to restore a past peak value, adjusting its nominal value to the inflation of the period. This adjustment was not applied horizontally to all wage levels. It was designed to have a distributive effect in favor of lower wages. Workers that were paid up to three minimum wages had their salaries adjusted by a value 10% superior to the past rate of inflation. The adjustment decreased inversely to the value of wages<sup>12</sup>. The most important element of this new wage policy was the change in the adjustment periodicity, from a yearly basis to a semester-to-semester one, which contributed to the upsurge of the inflation rate.

As a result of these four cost-push shocks (oil shock, interest rates hike, wage readjustments and exchange rate devaluation) happening almost at the same time, it is no surprise that the rate of inflation leaped to a new *plateau* (Bastos, 2002). In numerical terms, as those shocks were distributed over a certain period of time<sup>13</sup> we can only see their full effect in the 1980 rate of inflation. For instance, the average monthly inflation rate in the second semester of 1979 was 3.8%, whereas the monthly average of the first semester of 1980 was 6%. Consequently, the inflation rate accumulated in 12 months evolved from 41% in December 1978 to 77% in December 1979 and then moved forward to 110% in December 1980. It kept increasing until March 1981 when it reached 121%.

Moreover, the erratic daily administration of Brazil's economy between 1979 and 1982 made entirely ineffective the 1979 exchange rate maxi-devaluation which consequently produced no impact on trade balance. The trade deficit registered in 1980 was almost the same as the one observed in 1979. Meanwhile, the current account deficit was rising due to the snowball indebtedness described before. In brief, with the external situation worsening - the current account deficit jumped from US\$ 10 billion in 1979 to

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<sup>12</sup> The adjustment was, in fact, a bit more complicated in the case of salaries above three minimum wages. For example, in the case of workers who were paid "12 times the minimum wage", the adjustment rule was: 10% above inflation for the three-minimum wages "part" of the total wage; the full rate of inflation for the part between three and ten minimum wages and 80% for the remainder "two minimum wages". Workers and firms would freely negotiate the productivity growth rate. This wage policy was changed by the Law n° 6,886 passed on December 10<sup>th</sup>, 1980. The new rule did not change the main characteristics of the previous one (periodicity and adjustment to replace the past nominal peak), only the percentage of the past rate of inflation associated with different wage level brackets.

<sup>13</sup> The oil price increase started in the second semester of 1979 and extended throughout 1980, the same applying to the prices of other commodities. The new wage adjustment rule, as we said before, was enacted in October and finally the exchange rate devaluation happened in December.

approximately US\$ 16 billion in 1982 - the government was forced<sup>14</sup> to devalue the exchange rate once again by a large amount. In February 1983, there was a new maxi-devaluation of the Brazilian currency in relation to the US dollar, leading to the **eighth episode** of inflation rise in the 1951-85 period (from 104% in February 1984 to 236% in May 1984).<sup>15</sup>

Aware of the inflationary impacts of such exchange rate devaluation, the authorities tried to curb the existing wage indexation and hence the price-wage spiral. Nonetheless, the National Congress refused such proposals and finally established (by the Law n° 2,065) that the automatic wage adjustment would be effective only to salaries in the range between three to 15 minimum wages. Yet these attempts were not able to prevent the rate of inflation to double in 1983 and the purchase power of wages to fall by 15%.

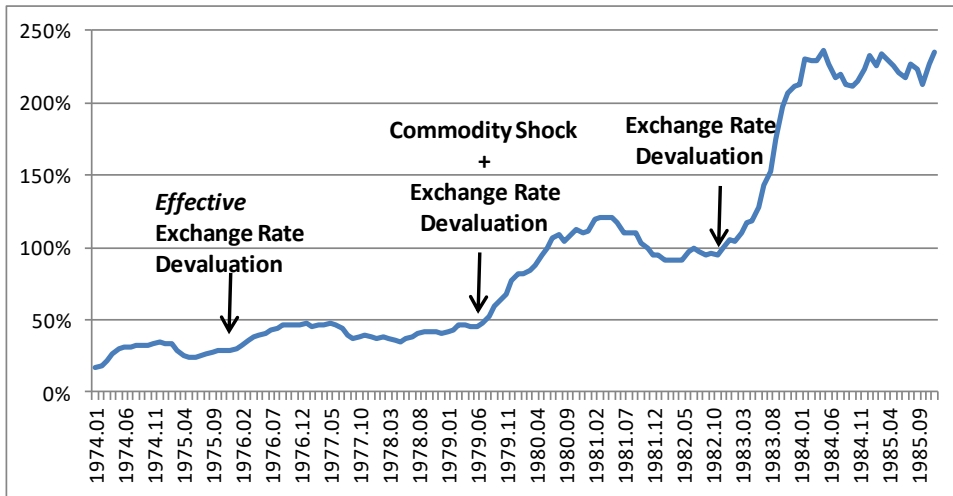
In sum, as it can be seen in figure 3, in three episodes inflation accelerated within the 1974-85 period and all of them were preceded by some sort of external shock. It is clear that the 1979 and 1983 shocks pushed inflation rates in Brazil to levels never reached before. Finally, figure 3 also reveals that the rate of inflation *stabilized* around 200% in the years 1983, 1984 and 1985. As previously noticed, such a behavior was common during the indexation period: after an external shock, the rate of inflation would move upward from an old *plateau* and then stabilize in a new *plateau*. At this time, however, quite distinct macroeconomic circumstances were at stake. The most important one was the extremely auspicious performance on the external front. After the first sizable trade surplus of 1983, the result for 1984 were even larger, with mega-surpluses of around US\$ 13 billion. Even more importantly, such values were obtained with the economy growing at a rate of 5.4% and 7.8% in 1984 and 1985, respectively. The positive performance on the external front allowed the authorities to keep the exchange rate almost constant in real terms.

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<sup>14</sup> At this point - after the Mexican and Polish defaults - the debt crisis for the developing countries was installed. Brazilian and IMF authorities initiated their conversations by the end of 1982 and the exchange rate devaluation was part of the agreement. The exchange rate devaluation was enacted while the first formal letter of intentions (the adjustment plan proposed by the Brazilian government) was still being studied by the IMF bureaucracy.

<sup>15</sup> According to Batista Junior (1983) this value corresponded to the appreciation of the exchange rate after the previous maxi-devaluation.

**Figure 3 – External Shocks and Inflation Upsurge (1974-85)**



Source: author's elaboration from Ipeadata.

The rate of inflation remained at a high *plateau* during the following years. At this point, stabilization was increasingly becoming the government top priority. In February 1986, the government launched a stabilization plan (Cruzado Plan), which intended to stabilize prices by dismantling the indexation schemes. It was the first of a series of failed stabilization programs until stabilization was finally achieved by Plano Real (Real Plan) in 1994.

### III – Econometric tests

This section is devoted to empirical tests with the nominal exchange rates and the rates of inflation registered in Brazil from 1951 to 1985. It is worth noting that we did not find many empirical econometric works on the particular subject of the present paper. One of the few exceptions is the work by Barbosa (1983) in which the author attempts to develop, and test econometrically, a structuralist model for inflation. Basically, the model takes as explanatory variables the excess of demand on internally consumed agricultural goods, and the external prices of export agricultural goods and imported goods. However, in Barbosa's theoretical model, the variable for external prices incorporates both the fluctuations in international prices in US dollars and in the real exchange rate (the value above past inflation). In addition to this feature, among other details that make Barbosa's inflation mechanisms distinct from the one assumed herein, when the author tests his model empirically his best specification has some important differences with respect to his own theoretical tenets. Due to limitations of data availability the best specification takes, as exogenous variables, the rate of change of government consumption, the increase in the rate of growth of oil and gas prices, and the gap between the rate of growth of agriculture production and its post-war trend. Definitely, this kind of result has almost no relationship with our basic hypothesis and tests, since the exchange rate is not tested and a variable that represents some degree of excess demand is included.

Modiano (1988) estimated a reduced form of a structuralist inflation model using exchange rate shock, nominal wages, import tariffs and subsidies on oil imports, the output gap, the domestic food supply gap, and commodities price index as exogenous variables for the 1966-1982 period. The exchange rate shock had strongest elasticity, a 1.4 coefficient. Even though the exchange rate variable differs from the one adopted in this paper, the results for a shorter period of time support the hypothesis that the trajectory of the exchange rate played a central role on Brazilian inflation. It is also interesting to notice that the extent of the multiplier effect of exchange rate over inflation will depend on the level of the inflation itself. A higher level of inflation leads to more wage indexation since the losses in terms of real wages would be almost impossible for workers to bear.

In this paper, we will develop a Vector Autoregressive (VAR) model with exogenous variables and apply a Granger causality test. The data employed are % monthly changes

of the average nominal exchange rate and % monthly changes of the inflation rate (IGPDI).

The analysis starts with unit root tests applied to both series. However, this analysis will not be restricted to the conventional Augmented Dickey-Fuller (ADF) test. Brazilian data are full of structural breaks and the two series employed here fit this pattern. As structural breaks may bias the results of traditional unit root tests towards false non-rejection of the null of non-stationarity, it is thus advisable to employ tests that take breaks into consideration as a way of properly dealing with them (Patterson, 2000: 277-78).

The literature of unit root tests with structural breaks started with the pioneering paper by Perron (1989), who assumed a single breakpoint would affect the level or the growth or both. This paper had as a major setback, which is the fact that the breakpoint is assumed to be known, a feature that grounds the criticism of *data-mining*. Zivot and Andrews (1992) then developed a test that was not subject to such criticism since the breakpoint was treated as unknown and calculated in a way that maximized the chances of the alternative hypothesis. However, this test did not include the hypothesis of structural break in the null (Patterson, 2000: 277-85). Finally, Lee and Strazicich (2003) developed a test that allowed up to two breakpoints, treated both of them as unknown and included them in the null hypothesis<sup>16</sup>. So this paper applies the Zivot & Andrews (1992) and Lee & Strazicich (2003) tests, in addition to the traditional ADF test. All of them were calculated in R.

The test results are presented in table 1. All tests showed that the exchange rate series does not present unit root.

**Table 1 – Unit root tests (exchange rate)**

	Test statistic	Critical values		
		1%	5%	10%
ADF	-17,14	-3,98	-3,42	-3,13
ZA	-18,44	-5,57	-5,08	-4,82
LS	-9,20	-6,42	-5,65	-5,32

<sup>16</sup> For a good summary of unit root tests with structural breaks prior to the 2000s, see Patterson (2000). For a brief summary of these tests including Lee and Strazicich (2003) test, see Greasley and Oxley (2011).

However, the results were not conclusive when it comes to the inflation rate data. The ADF (for 5%) and Zivot & Andrews (ZA) tests showed that the series is stationary, but the Lee & Strazicich (LS) test showed the opposite result (see table 2).

**Table 2 – Unit root tests (inflation rate)**

	Test statistic	Critical values		
		1%	5%	10%
ADF	-3,48	-3,98	-3,42	-3,13
ZA	-6,26	-5,57	-5,08	-4,82
LS	-4,98	-6,42	-5,65	-5,32

Due to the inconclusive results, it was decided to develop two VAR models, one in level and the other applying the inflation rate series in differences. These models included intercept, a trend and the significant dummies suggested by the LS test as the structural break points of both series. According to the LS results, a trend break was found in the inflation rate series in February 1977, while the exchange rate series presented a trend and a level break in August 1964. In the case of the differentiated inflation rate series, a trend break was found in February 1961 and another one in June 1982<sup>17</sup>.

The VAR that included the differentiated inflation rate series performed very poorly. For instance, it had a low  $R^2$ , autocorrelation, heteroscedasticity and nonnormality in the residuals. The VAR in level proved to perform much better. We started with a VAR without exogenous variables<sup>18</sup>. Based on this model, we analyzed the lag length criteria (table 3), based on which it was decided to incorporate 12 lags in the model.

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<sup>17</sup> All three unit root tests showed that the differentiated inflation series is stationary.

<sup>18</sup> The VAR models were calculated in E-Views 8.0.



**Table 3 – VAR Lag Order Selection Criteria****VAR Lag Order Selection Criteria**

Endogenous variables: IGPDI CAMBIO

Exogenous variables: C

Sample: 1951M01 1985M12 Included observations: 408

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2408,48	NA	464,21	11,82	11,84	11,82
1	-2151,31	510,57	134,19	10,58	10,63	10,60
2	-2132,02	38,11	124,50	10,50	10,60	10,54
3	-2115,27	32,92	116,96	10,44	10,58 *	10,49 *
4	-2108,79	12,67	115,55	10,43	10,60	10,50
5	-2106,90	3,67	116,75	10,44	10,65	10,52
6	-2100,78	11,85	115,55	10,43	10,68	10,53
7	-2099,51	2,44	117,11	10,44	10,73	10,56
8	-2096,23	6,29	117,52	10,44	10,78	10,57
9	-2093,89	4,46	118,49	10,45	10,82	10,60
10	-2080,88	24,68	113,37	10,41	10,82	10,57
11	-2080,37	0,97	115,34	10,42	10,88	10,60
12	-2069,07	21,21 *	111,29 *	10,39 *	10,88	10,58

\* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Then, a VAR in level was estimated, including intercept, trend and the dummies for the inflation and exchange rate series as exogenous variables. This VAR model had a high  $R^2$ , for instance<sup>19</sup>. Moreover, based on the AR root table, it satisfies the stability condition (see table 4).

<sup>19</sup> The exchange rate equation was not estimated properly. However, this is a traditional problem in the econometric literature on the exchange rate.

**Table 4 – Vector Autoregression Estimates**  
**Vector Autoregression Estimates**

Sample (adjusted): 1952M01 1985M12

*t*-statistics in [ ]

Included observations: 408 after adjustments

	IGPDI	CAMBIO		IGPDI	CAMBIO
IGPDI(-1)	0,37 [ 7.4]	-0,05 [-0.2]	CAMBIO(-4)	0,03 [ 2.6]	-0,02 [-0.4]
IGPDI(-2)	-0,02 [-0.4]	0,50 [ 1.7]	CAMBIO(-5)	0,01 [ 0.7]	-0,05 [-1.0]
IGPDI(-3)	0,12 [ 2.2]	0,19 [ 0.7]	CAMBIO(-6)	0,03 [ 2.6]	0,01 [ 0.1]
IGPDI(-4)	-0,02 [-0.3]	0,05 [ 0.2]	CAMBIO(-7)	0,01 [ 0.5]	-0,07 [-1.3]
IGPDI(-5)	-0,04 [-0.6]	-0,08 [-0.3]	CAMBIO(-8)	0,02 [ 2.4]	-0,03 [-0.5]
IGPDI(-6)	0,05 [ 0.9]	-0,08 [-0.3]	CAMBIO(-9)	0,02 [ 1.6]	-0,05 [-0.9]
IGPDI(-7)	-0,05 [-0.9]	-0,18 [-0.6]	CAMBIO(-10)	0,00 [ 0.4]	0,19 [ 3.7]
IGPDI(-8)	-0,05 [-0.9]	0,25 [ 0.8]	CAMBIO(-11)	0,00 [ 0.5]	0,00 [-0.1]
IGPDI(-9)	-0,03 [-0.6]	0,12 [ 0.4]	CAMBIO(-12)	0,01 [ 1.3]	-0,09 [-1.7]
IGPDI(-10)	0,09 [ 1.6]	-0,29 [-1.0]	C	-0,38 [-1.5]	2,68 [ 1.9]
IGPDI(-11)	-0,07 [-1.3]	-0,14 [-0.5]	TT	0,01 [ 3.9]	-0,01 [-0.5]
IGPDI(-12)	0,20 [ 3.8]	0,38 [ 1.4]	DC	-1,33 [-3.9]	-0,74 [-0.4]
CAMBIO(-1)	0,02 [ 1.7]	0,08 [ 1.5]	DTC	-0,01 [-2.3]	0,00 [ 02]
CAMBIO(-2)	-0,01 [-0.6]	0,00 [-0.1]	DTI	0,02 [ 2.8]	0,06 [ 1.2]
CAMBIO(-3)	0,00 [-0.1]	-0,06 [-1.2]	R-squared	0,81	0,19
			Adj. R-squared	0,79	0,13
			F-statistic	56,15	3,19
<b>Roots of Characteristic Polynomial</b>				First root (Modulus)	
				0,926	
				0,907	
No root lies outside the unit circle.				0,897	
VAR satisfies the stability condition.				0,897	

Then, the next step was to apply the VAR Granger Causality/Block Exogeneity Wald Test. As shown in figure 8, the results were in line with the interpretation that is being set in this paper: the exchange rate change Granger-causes the rate of inflation, but the rate of inflation does not Granger-causes the fluctuations in the exchange rate. This result does not imply of course that the exchange rate change actually causes the inflation rate: it simply implies that the exchange rate cannot be treated as an exogenous variable in relation to the rate of inflation. In any case, it provides additional evidence that we cannot refuse the structuralist hypothesis.

**Table 5 – VAR Granger Causality/Block Exogeneity Wald Tests**

<b>VAR Granger Causality/Block Exogeneity Wald Tests</b>			
Dependent variable: IGPD			
Excluded	Chi-sq	df	Prob.
CAMBIO	24,17	12	0,02
Dependent variable: CAMBIO			
Excluded	Chi-sq	df	Prob.
IGPDI	11,12	12	0,52

Nevertheless, it is also mandatory to make a series of tests in the residuals, in order to ensure the results achieved so far. Hence, autocorrelation, heteroscedasticity and normality tests were applied. To face the autocorrelation problem LM tests were used. No autocorrelation in the residuals was found (see table 6).

**Table 6 – Residuals Tests**

Endogenous variables: IGPD I CAMBIO

Exogenous variables: C TT DC DTC DTI

Lag specification: 1 to 12

<b>LM Test</b>		<b>White Test</b>	
Lag	Probs (chi-square, 4 df)	Joint Test (Chi-sq, 165 df)	
1	0,10		Prob.
6	0,25		0,00
12	0,23	Individual components Chi-sq(55)	
<b>Jarque-Bera</b>		Dependent	Prob.
<b>df</b>	<b>Prob.</b>	res1*res1	0,00
4	0,00	res2*res2	0,95
		res2*res1	0,03

When it comes to the normality test, the results were not so positive. Figure 9 ahead shows that the normality hypothesis was rejected for both equations and for the model as a whole.

The heteroscedasticity test also produced negative results. It showed a high probability of heteroscedasticity in the residuals of the inflation equation (res1\*res1), but also in the correlation of the residuals of the two variables (res2\*res1).

This result is particularly negative since the presence of heteroscedasticity invalidates the Granger causality test applied before. Therefore, it became necessary to correct this heteroscedasticity problem; otherwise, the former result of the Granger test would not stand.

For this purpose, we estimated two systems by means of different estimation methods, but both were estimated following the same specification employed in our original VAR in level with exogenous variables. The first system was estimated using weighted least squares with weights - in each of the equations - equal to the inverse of the variance of the residuals estimated by minimum least squares. In the second system, the Seemingly Unrelated Regression (SUR) methodology was used. This alternative method was chosen due to the correlation in the residuals of the two equations that was detected by the heteroscedasticity test. In order to test for Granger causality, the Wald test was used for

all the lags of the exchange rate change variable in the inflation equation. Restrictions for all the inflation lags were accordingly specified in the exchange rate change equation.

The tests pointed out no change in terms of the former Granger causality tests results. Therefore, inflation does not Granger-cause the exchange rate change, but the exchange rate change does Granger-cause inflation (see table 7).

**Table 7 - System SUR/Wald Tests**

<b>System SUR/Wald Tests</b>			
Dependent variable: IGDPDI			
Excluded	Chi-sq	df	Prob.
CAMBIO	26,02	12	0,01
Dependent variable: CAMBIO			
Excluded	Chi-sq	df	Prob.
IGPDI	11,97	12	0,45
<b>System Weighted Least Squares/Wald Tests</b>			
Dependent variable: IGDPDI			
Excluded	Chi-sq	df	Prob.
CAMBIO	26,02	12	0,01
Dependent variable: CAMBIO			
Excluded	Chi-sq	df	Prob.
IGPDI	11,97	12	0,45

In other words, the evidence shows that the former result is not invalid.

## Conclusions

This paper examined - in the Brazilian case - the structuralist hypothesis that high inflation rates in Latin America during the second half of the 20<sup>th</sup> century were the result of external shocks that triggered an internal reaction of distributive variables generating a cost-price spiral. For this purpose, it developed an historical analysis of the Brazilian data and carried out a number of econometric tests.

Among eight episodes of inflation upsurge detected from 1951-1985, seven were preceded by or concurrent to a type of external shock (foreign exchange devaluation, or commodity price-shocks, or both), suggesting that external shocks were an important trigger behind the inflation upsurge episodes.

The econometric analysis presented in the paper provided evidence that the structuralist hypothesis should not be refused. A VAR model with exogenous variables was estimated for the 1951-1985 period using the % monthly changes of the average nominal exchange rate and the % monthly changes of the inflation rate as endogenous variables. Hence, the Granger causality test showed that inflation does not Granger-cause the fluctuations in the exchange rate, but the fluctuations in the exchange rate do Granger-cause inflation. The residual tests showed heteroscedasticity and thus challenged the validity of the Granger test results, but systems estimated by weighted minimum squares and the SUR methodology proved that the Granger test results hold.

This paper did not aim to estimate a closed model for inflation, given the complexity of institutional and political changes that took place in the long period analyzed. Further econometric developments may be necessary to establish a quantitative relationship between movements in the exchange rate and inflation. However, the econometrical tests revealed a broad picture of particular interest insofar: that the exchange rate had a persistent impact on inflation, during a long period when internal public financing (both institutional instruments and the value of the deficit) changed markedly. Besides that, throughout the whole period studied monetary policy also varied significantly, as well the structural conditions of specific components of the aggregate supply, such as agricultural supply and energy production.

Therefore, our tests suggest that, in spite of changes in other macro and microeconomic variables, the external factor undoubtedly plays a key role in explaining the persistent and predominately high inflation throughout the period analyzed. Seven of the eight episodes described here were related to external shocks. As argued along Section 2, there are strong reasons to argue that in all seven episodes the devaluations of the exchange rate were caused by problems due to high income elasticity of imports contrasting to slow growth of commodity exports, and /or deteriorated terms of trade, and/or world commodity price increases - sometimes accompanied by the worsening of external financial conditions (both international rates of interest and the limitation of external voluntary financial flows to Brazil). Therefore, this historical pattern suggests that the external conditions are crucial to explain the long-term inflationary process in Brazil. For sure, further studies are requested to go into the details of the impact of the devaluation of the exchange rate on inflation based on its interaction with internal variables, such as wage resistance by workers.

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## **Annex 1: Episodes of Inflation Upsurge**

The first month of each episode is the month of the lowest inflation rate before inflation rates started to increase.

### **Episode 1:**

July 1953 – May 1954

Lowest rate: 12%

Highest rate: 32%

### **Episode 2:**

April 1956 – January 1957

Lowest rate: 14%

Highest rate: 28%

### **Episode 3:**

February 1958 – August 1959

Lowest rate: 4%

Highest rate: 42%

### **Episode 4:**

February 1961 – April 1964

Lowest rate: 28%

Highest rate: 94%

### **Episode 5:**

November 1973 – December 1974

Lowest rate: 15%

Highest rate: 35%

### **Episode 6:**

December 1975 - January 1977

Lowest rate: 29%

Highest rate: 47%

**Episode 7:**

June 1979 – March 1981

Lowest rate: 45%

Highest rate: 121%

**Episode 8:**

February 1983 – May 1984

Lowest rate: 104%

Highest rate: 236%