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**THE MIRROR'S IMAGE  
(THE LABOR MARKET RESPONSE TO THE  
CRUZADO AND COLLOR PLANS)**

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The Mirror's Image  
(The Labor Market Response to the Cruzado and Collor Plans)

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Contents: I. Introduction; II. The Real Wage and Inflation; III. The arithmetics of inflation and distribution; IV. Distributive Dissatisfaction; V. Wage costs and Inflation; VI. Stabilization and the Labor Market; VII. Concluding Notes.

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## I. Introduction

The distribution of income broadly defined --that is, including relative prices and wages as well as the distribution between wages and profits-- is intimately associated with the path of inflation in Brazil. The relation between distribution and inflation has been shadowed by two other elements associated with the inflationary phenomenon, namely, the notion of 'inertial inflation' and the role played by the fiscal debt in creating inflationary pressures.

In 1986, the Cruzado Plan was designed based on the idea that inflation was inertial. The rate of inflation was virtually independent from aggregate demand and the distribution of income. The second Collor Plan in 1991-2 let prices free to move according to market forces and relied essentially on a very strict monetary policy.<sup>2</sup> While the Cruzado Plan relied exclusively on the price freeze, the second Collor Plan relies on demand contraction. The distributive aspects of inflation were not consider in either plan.

The objective of this paper is to show that the inflationary process is intimately associated with the distribution of income and, as a corollary, that alternative stabilization policies have different impacts on the distribution of income through the workings of the labor market.

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<sup>2</sup>. A liberal reform based on the privatization program and the opening of the economy and a fiscal reform would eventually establish the basis for a stable economy. Since these reforms take time, the tight monetary policy is seen as required to discourage the acceleration of inflation.

## II. The Real Wage and Inflation

In an economy with high inflation, real wages oscillate dramatically. Wage laws and private arrangements between unions and firms reduce the impact of price increases on the purchasing power of wages through periodical adjustments of money wages to past inflation. Inevitably, however, between two wage adjustments, real wages fall. With 20% monthly inflation for example --something not unusual in Latin American countries over the 80's-- if wages are adjusted to past inflation every three months, the real wage will fall around 40% over the adjustment period.<sup>3</sup>

In an economy with 20% monthly inflation, every month, hundreds of wage bargains take place and hundreds of thousands of firms have to make price decisions. Transaction costs preclude bargains between unions and firms and among suppliers and clients to take place every week or month. Wages and prices are adjusted periodically, but not in a synchronous fashion. The fact that wage bargains are spread over the year reduces the level of information on the future path of inflation. Changes in the conditions of the economy affect in unforsseable ways the bargaining power of unions negotiating over the year. An union negotiating today has enormous difficulties in forecasting the impact on inflation of wage bargains of other labour groups in the future.

For each agent in the economy, the higher the level of inflation and the longer the period of adjustment of its

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<sup>3</sup>. That is, if wages are adjusted in January 1st, the purchasing power of wages will be 40% smaller in March 31th, just before a new adjustment.

respective price, the greater the risk of incurring in losses if the actual rate of inflation exceeds the expected rate. Thus, bargains over the wage and over the pattern of wage adjustments between negotiations tend to be complicated and difficult for both firms and unions.

When the rate of inflation is not only high but also irregular, the task of the unions trying to guess the path of inflation becomes even harder. The level of uncertainty --or the inability to form a probabilistic guess about the future course of inflation-- increases with the variance of inflation. There are many factors affecting the variance of inflation in economies with high and chronic inflation. Public tariffs and the exchange rate often lag behind inflation thus leading to fiscal and balance of payments difficulties in face of which the government is forced to promote major adjustments, thus affecting the path of inflation. Price freezes, usually followed by inflation spurs, also augments the variability of the rate of inflation.

These factors contribute to make the wage bargain process very difficult in economies with high and volatile rates of inflation. This is why unions are constantly trying to shorten the adjustment period of automatic wage adjustments in order to reduce the risks of suffering unexpected wage losses. For the same reasons, the attitude of unions in wage bargains tend to be quite different from their attitude in economies with low and stable rates of inflation. In an environment of accelerating inflation and uncertainty about the degree of acceleration, the incentives for wage moderation are virtually none.

### III. The arithmetics of inflation and distribution

The following model mimics the pattern of wage bargains and wage adjustment pattern found in most Latin American economies with high inflation. Wages are negotiated once a year and adjusted to past inflation periodically over the year. The length of the indexation period varies from zero (when wages are not adjusted over the year) to one month (when wages are adjusted every month) to one week or one day in cases of hyperinflation. Wage laws usually determine the indexation period but in many cases, unions privately negotiate shorter intervals with firms.

The degree of centralization of the wage bargain varies from country to country, and within the same country, from industry to industry. There are countries in which bargains take place at the level of the firm, others in which they take place at the industry level or sectoral level, and others (but not in Latin America) in which negotiations take place at the national level. Here, we are thinking of a case in which negotiations are decentralized and not synchronized. However, the level of decentralization is different from industry to industry and variable over time.

In order to provide a simple and rigorous analysis of the relation between inflation and the path of real wages over time, let us assume that, over a year, the monthly rate of inflation is constant. Over the year, wages are automatically adjusted to inflation  $N$  times. The 'period of adjustment' --that is, the interval between two automatic adjustments-- is given by  $\psi = 1/N$ . If wages are adjusted three times a year, for example, the period of adjustment is equal to  $\psi = 1/3$  of a year, that is, four

months.

The illustration below shows the case in which wages are adjusted three times a year. We will assume that, in each industry, the money wage is negotiated between unions and firms once a year. Over the year, wages are fully adjusted to inflation at the end of every adjustment period. For example, if monthly inflation is 20%, and the adjustment period is four months, at the end of the fourth month the money wage will be automatically adjusted in 52% to recover the peak level attained immediately after the negotiation.<sup>4</sup>

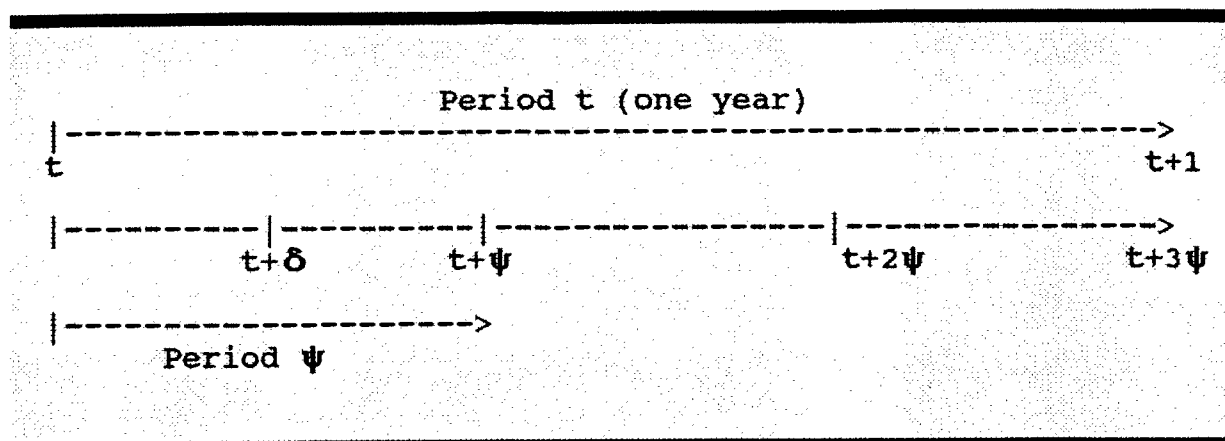


Illustration 2.1

With constant inflation, and making  $\delta \equiv \psi/2$ , we can write:

$$1. \quad P_{t+\psi}/P_{t+\delta} = P_{t+\delta}/P_t$$

where  $P_{t+\tau}$  is the price level in  $t+\tau$  where  $\tau$  can be zero,  $\delta$  or  $\psi$ . If wages in sector  $j$  of the economy are negotiated in the beginning of the year, say at  $t$ , the 'peak real wage', that is

<sup>4</sup>. In most countries with high inflation, a wage law determines the adjustment period as well as the degree of adjustment of the money wage to past inflation.

the real wage immediately after the negotiation, will be given by the ratio between the money wage ( $W_{t,j}$ ) and the price level in  $t$  ( $P_t$ ):

2.  $\omega^p_{t,j} = W_{t,j} / P_t$  .....peak real wage

The 'average real wage' over the adjustment period, that is, over  $\psi$ , will be given by the ratio between the money wage negotiated in  $t$  and the price level in the middle of the adjustment period, that is, the price level in  $t+\delta$  ( $P_{t+\delta}$ ):

3.  $\omega_{t,j} = W_{t,j} / P_{t+\delta}$  .....average real wage

Using equations 1 to 3, we can write the average real wage as a function of the peak real wage:

4.  $\omega_{t,j} = \omega^p_{t,j} (P_t / P_{t+\delta})$

According to equation 4, The average real wage depends on the peak wage and the rate of inflation as given by the ratio  $P_t / P_{t+\delta}$ . The annual rate of inflation is given by

5.  $1 + p_t = (P_{t+\psi} / P_t)^N = (P_{t+\delta} / P_t)^{2N} = (P_{t+\delta} / P_t)^{1/\delta}$

which obviously implies

5'.  $(1 + p_t)^\delta = (P_{t+\delta} / P_t)$



Replacing 5' in 4 gives:

$$6. \quad \omega_{t,j} = \omega_{t,j}^p (1 + p_t)^{\delta}$$

When negotiating money wages at the beginning of the year, unions attempt to recover the purchasing power losses of wages incurred due to inflation since the last bargain.<sup>5</sup> We assume that, given the CPI inflation over year t-1 ( $p_{-1}$ ), the union negotiating with firm(s) j, bargain over the 'indexation parameter'  $\lambda_j$  in the following wage equation:

$$7. \quad W_{t,j} = W_{-1,j} [1 + \lambda_j p_{-1,j}]$$

The equation says that the money wage in t ( $W_j$ ) is equal to the wage in t-1 ( $W_{-1,j}$ ) adjusted to inflation over t-1. The degree of adjustment is given by  $\lambda_j$ . When  $\lambda_j$  is equal to one we refer to 'perfect indexation', and when it is greater than one, we refer to over-indexation.

From equation 7 it is easy to see that the peak real wage in t depends on the peak wage in t-1 and the indexation factor according to the following equation:

$$8. \quad \omega_{t,j}^p = \omega_{-1,j}^p [(1 + \lambda_j p_{-1}) / (1 + p_{-1})]$$

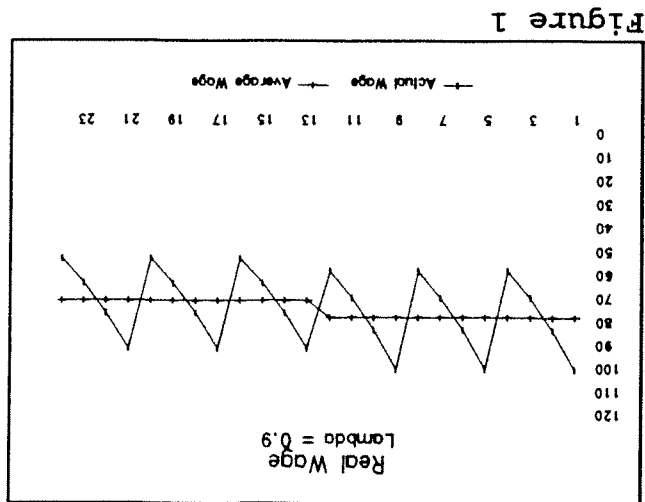
Equation 6 can now be written in terms of the indexation

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<sup>5</sup>. With automatic and complete indexation over the year workers will not incur in any loss. However, in the absence of complete or perfect indexation, there is a loss to be negotiated in annual wage bargain.

Figure 1 shows the situation in which the indexation factor resulting from the annual bargain between the union and the firm(s) is smaller than one ( $\lambda = 0.9$ ). In this case, the wage is only partially indexed to past inflation, and the average real wage will necessarily fall. The reduction in the peak wage

level at the end of every adjustment period. Over the year, the wage recovers the peak wage is determined. Wages are negotiated once a year when the annual peak over time. The higher the rate of inflation, the steeper the curve and the greater the reduction of the real wage logarithm of the real wage over two years (months 1 to 24) and the average real wage. Figures 1 to 4 depict the path of the adjustment period ( $\lambda$ ), the rate of inflation ( $p_t$ ) and the Equation 9 says that the average real wage depends on



$$9. \quad w_{t,j} = \{w_{t-1,j} [1 + \lambda p_{t-1}] / [1 + p_t]\} [1 + p_t]^\theta$$

parameter  $\lambda$ :

negotiated in month 13 determines a reduction in the average real wage, given the rate of inflation and the length of the adjustment period. Figure 2 shows the path of the real wage and the average real wage when the indexation factor is greater than 1 ( $\lambda = 1.1$ ). The increase in the peak wage in month 13 implies an increase in the average real wage in the second year. In the case where the indexation factor is one, the average real wage remains constant over the two years.

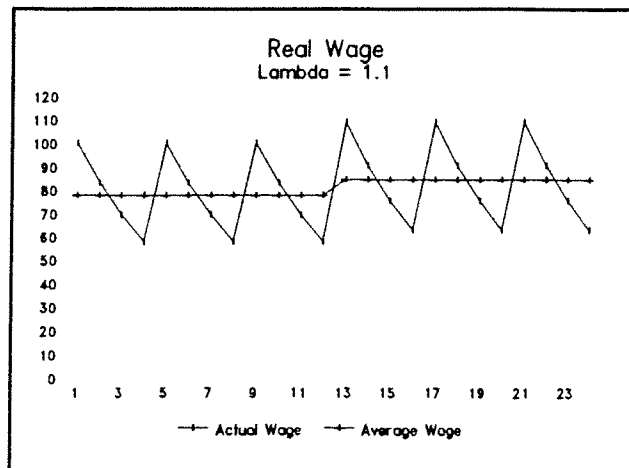


Figure 2

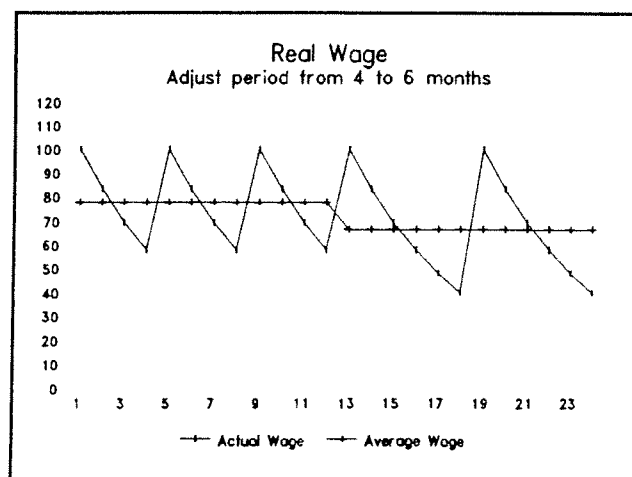


Figure 3

Figure 3 depicts the case in which the monthly rate of inflation falls from 20% in the first year to 10% in the second year. The wage curve becomes flatter in the second year determining an increase in the average real wage, given the peak wage and the length of the adjustment period.

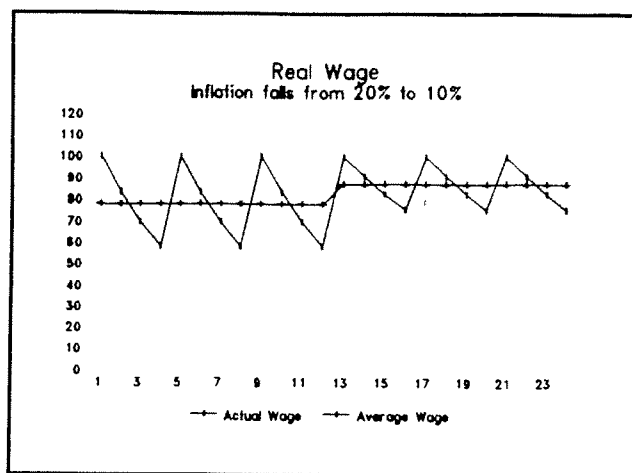


Figure 4

Finally, figure 4 shows the effect over the average real wage of an increase in the length of the adjustment period from 4 months in the first year to 6 months in the second year. The average real wage will fall for a given rate of inflation.

#### IV. Distributive Dissatisfaction

In negotiating with firms, unions have a certain target or desired real wage. The target wage is not arbitrary. It results from certain conditions affecting the bargaining power of the union among which labor market conditions and capital-labor relations play a prominent role. In a recession, the bargaining power becomes smaller due to the increase in the cost of job loss to workers. Given the determinants of labor demand, the bargaining power of workers also depends on the relation between

the real wage and productivity.<sup>6</sup> In general, corporations in the industrial sector avoid reducing the real wage of their core workers in order to maintain their commitment to the objectives of the firm. Let us write the target wage as a function of the level of economic activity ( $E$ ) and a firm-specific parameter ( $A_j$ ) to capture the 'efficiency wage effect':

$$10. \quad \omega^d = \omega(E, A_j)$$

A situation of distributive dissatisfaction arises when the real wage (as determined by equation 9) is smaller than the target real wage, that is:

$$\{\omega_{-1,j}^p [(1 + \lambda_j p_{-1}) / (1 + p_{-1})]\} [1 / (1 + p_t)^{\delta}] < \omega(E, A_j)$$

Given the target wage, the expected rate of inflation in  $t$  ( $p_t^e$ ) and the indexation period ( $\delta$ ), there exists a level of  $\lambda$  for which  $\omega = \omega^d$ . As shown in Figure 5,  $\omega$  is a linear function in  $\lambda$ . An increase in the expected rate of inflation or an increase in the length of the adjustment period, shift the  $\omega$  line downwards. Either one of the modifications require an increase in the indexation factor in order to close the 'dissatisfaction gap' given by  $\omega - \omega^d$ . On the other hand, in face of an increase in the level of economic activity the indexation factor will also have to increase in order to close the gap arising from the increase in the target wage.

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<sup>6</sup>. We have in mind the arguments for real wage rigidity put forward by the efficiency wages literature. See, for example, McDonald & Solow (1981) and Shapiro & Stiglitz (1984).

Figure 5 (end of text)

The effect over the labor market of changes in the level of economic activity is crucially affected by the determinants of the target real wage, and hence on the degree of real wage rigidity in different sectors of the economy. In the formal sector, or more precisely, in the 'modern core' of the economy - -ie, the big corporations in the industrial sector-- the target wage, and hence the real wage tends to be rigid both downward and upward. That is, **relatively rigid** in comparison with wages in other segments of the economy, namely, smaller firms in the industrial sector, and the service and commercial sectors. As a result, changes in aggregate demand are associated with changes in the sectoral pattern of employment and relative wages.

In a recession, the level of employment in the modern sector will fall leading to an increase in open unemployment and the level of employment in the informal segment of the labor market (the self-employed and the workers **sem carteira assinada**).<sup>7</sup> The real wage of the workers who remained employed in the modern sectors will fall less than the wage of workers in the other sectors. In an expansion, the opposite is likely to happen: the modern sector will absorb workers from the other sectors but real wages will not grow as much.

#### V. Wage costs and Inflation

We assume that firms fix a mark-up over direct average

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<sup>7</sup>. In Brasil, wage workers are divided into two groups: the legal workers (**com carteira de trabalho assinada**) and the illegal workers (**sem carteira**).

costs. The size of the mark-up varies with structural factors (such as barriers to entry, monopoly rights, protection from international competition) as well as short-run fluctuations (such as movements in the elasticity of demand). Firms have only direct labour costs. The price equation of a typical firm  $j$  is given by:

$$11 \quad P_j = M_j (W_j / \Delta_j)$$

where:  $P_j$  = wholesale price of good  $j$ ,  
 $M_j$  = profit margin over direct costs,  
 $W_j$  = money wage rate,  
 $Z_j$  = average product of labour,

The time derivative of this equations yields the rate of inflation of the price of good  $j$ :

$$2. \quad p_j = m_j + c_j$$

where  $c_j = (w_j - \zeta_j)$  and all lowercase letters represent the time derivative of the corresponding variables. Price inflation can also be written as:

$$12 \quad p_j = \epsilon_j c_j$$

From the two equations it is clear that whenever  $\epsilon_j > 1$ , the mark-up increases, and vice-versa, that is,  $m_j > 0$  when  $\epsilon_j > 1$ . The variable  $\epsilon_j$  measures the degree of indexation of the price level of firm  $j$  to cost inflation.

Dividing equation 7 by  $W_{-1,j}$ , yields:

$$7' \quad w_j = \lambda_j p_j$$

Equations 7' and 12 together imply the following equation for the rate of price inflation in sector j:

$$13 \quad p_j = \epsilon_j \lambda_j (\omega^d, p^e_t, \delta) p_j$$

where we have written the indexation factor as a function of the desired or target wage, the expected rate of inflation and the length of the indexation period. Taking as given the indexation factor  $\epsilon_j$ , the rate of inflation of prices in sector j will therefore depend on the determinants of  $\lambda_j$ .

#### **VI. Stabilization and the Labor Market**

Over the last ten years the monthly rate of inflation in Brazil oscillated between zero and 80%. The periods of null inflation were associated with price freezes in 1986, 1987, 1989 and 1990. The peak rates occurred a few months after the end of the price freezes.

Stabilization plans between 1986 and 1989 -- the Cruzado Plan (1986), the Bresser Plan (1987) and the Verão Plan (1989)-- had two important characteristics: first, they were based on price freezes, and second, in none of them the government adopted any kind of active aggregate demand policy. They were all price freezes in an environment of 'full employment'. The Collor Plans I (in 1990) and II (1991-2), on the other hand, were marked by a deep recession. Indeed, the monetary policy was deliberately used to curb inflationary pressures.

In what follows we compare two very different stabilization



attempts, namely, the 'heterodox' Cruzado Plan and the 'orthodox' Collor Plans, with emphasis on the second Collor Plan.<sup>8</sup> In the Cruzado, we had a price freeze with accommodative demand policy whereas in the (second) Collor, we had market prices with very restrictive demand policy. How does the labor market responded to these two experiences?

Two were the salient characteristics of the Cruzado Plan: first, the fact that, for a few months, there was a pervasive expectation that the rate of inflation would remain low; and second, the wage policy was such that wages would be automatically adjusted to inflation each time the accumulated rate of inflation reached 20% (**scala mobile**). Both the reduction in the expected rate of inflation and the warranted adjustment of wages to inflation had a negative effect on the indexation factor  $\lambda$ . On the other hand, the rapid growth of aggregate demand<sup>9</sup> naturally led to an increase in the target real wage ( $w^d$ ).

Figure 6a shows the path of real wages for four labor groups over the Cruzado Plan: industrial workers, legal workers in all sectors ("com carteira"), illegal workers ("sem carteira"), and self-employed workers. The real wage of industrial workers grew less than the wages of legal and illegal workers; and the incomes of the self-employed grew much more than the others. This is an evidence that the wage of legal workers, in general, and industrial workers, in particular, is less affected by fluctuations in aggregate demand than wages in other segments of

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<sup>8</sup>. In fact, the Collor Plan I was based on a price freeze and aggregate demand contraction.

<sup>9</sup>. See Ros (1988) for the effects of price freezes on aggregate demand.

the labor market.

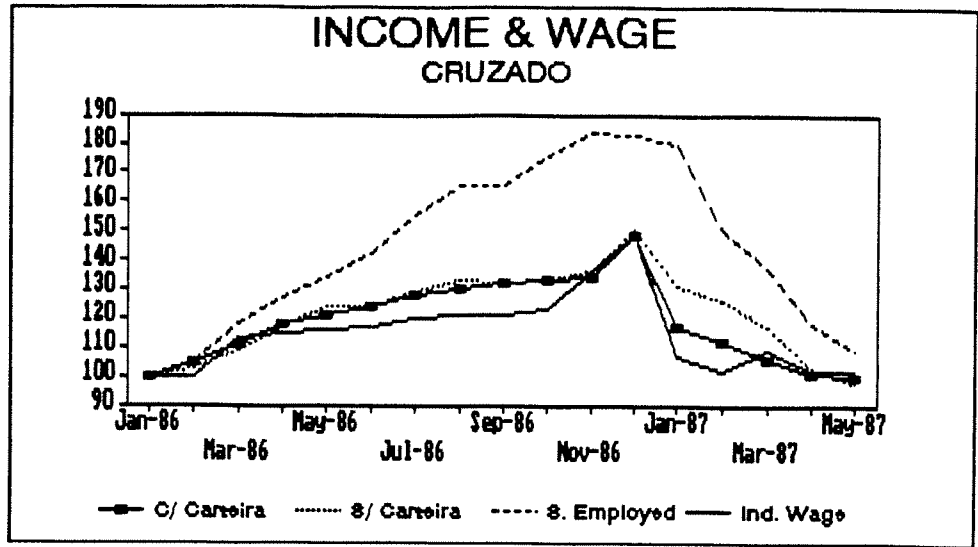


Figure 6a

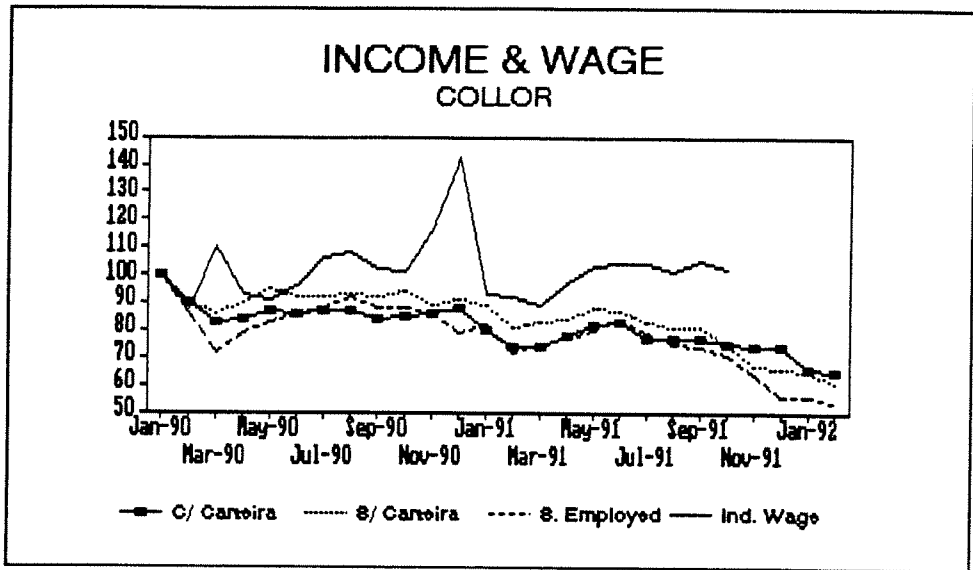


Figure 6b

During the Cruzado Plan, open unemployment fell from 4% to 2% according to the official institute of statistics (IBGE) and from 7% to 5% in the great São Paulo area according to the Sistema Estadual de Análise de Dados/SEADE-SP (Figure 7a).

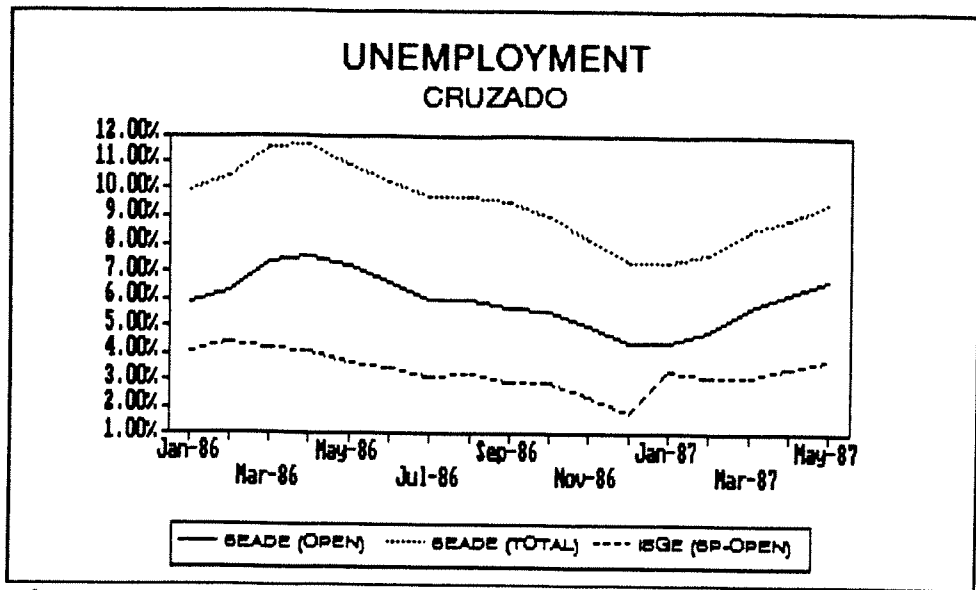


Figure 7a

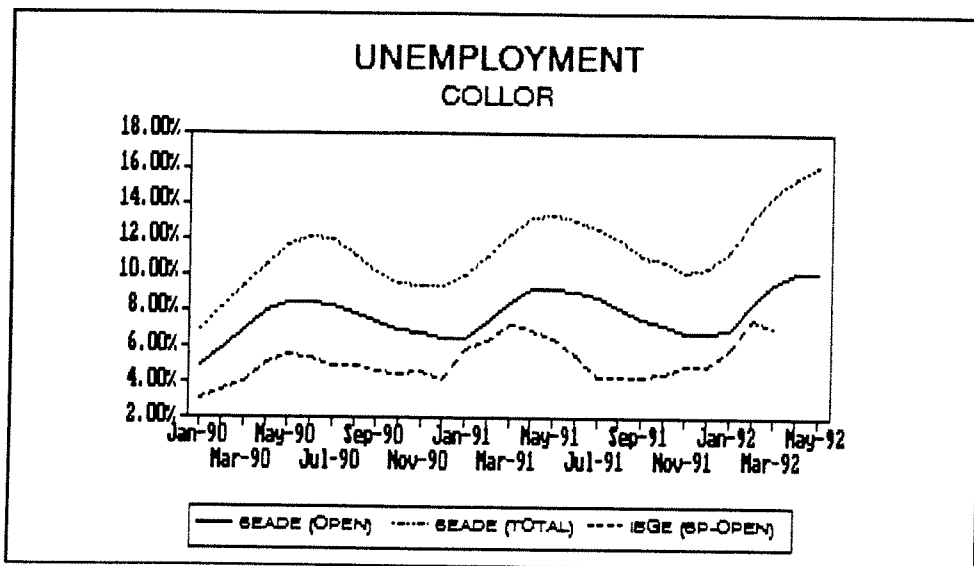


Figure 7b

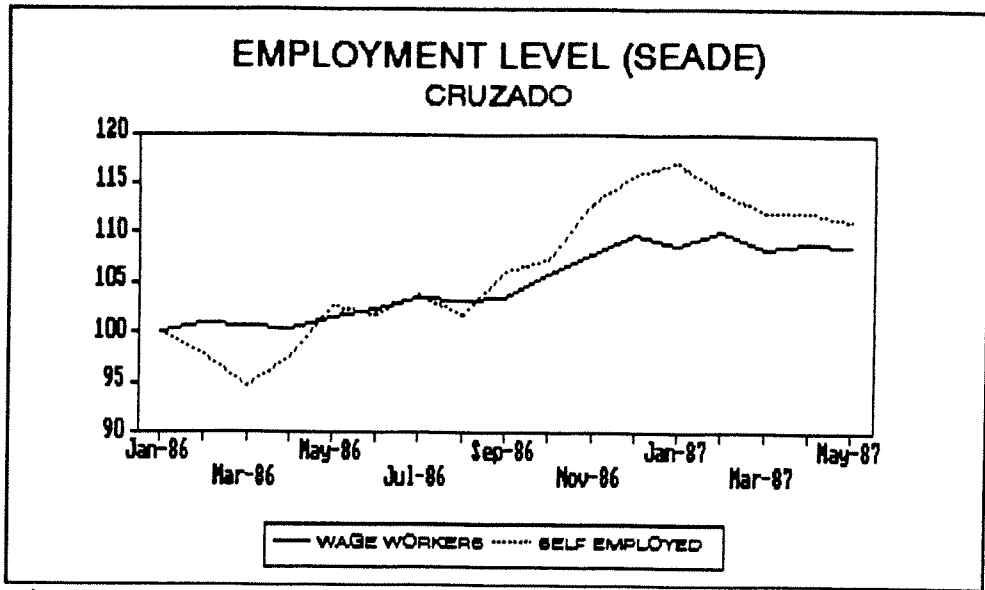


Figure 8a

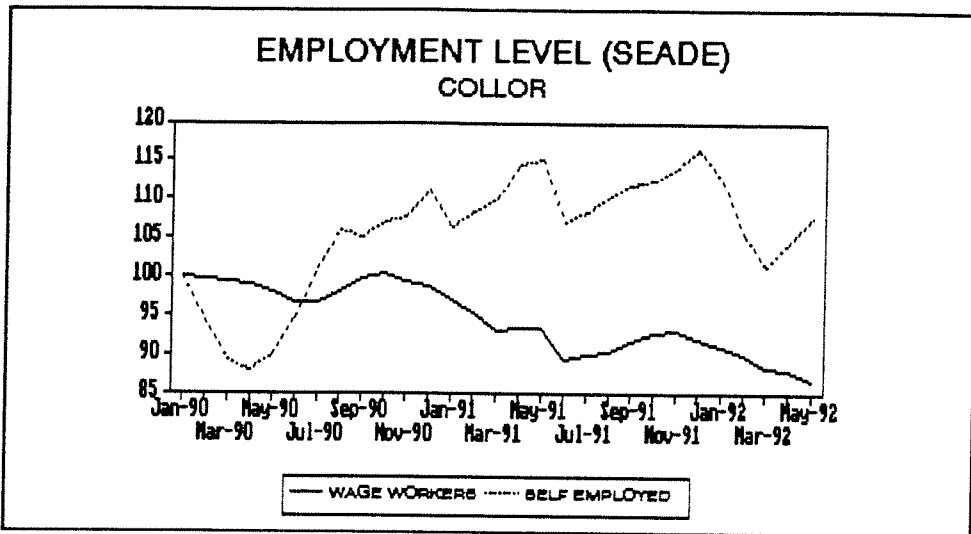


Figure 8b

The level of employment of both wage workers and self-employed in São Paulo grew during the Cruzado Plan (Figure 8a). It grew in all sectors of the economy (industry, commerce and services) as shown in Figure 9a, but grew much faster in industry. Figure 10a shows the path of employment for Brazil as

a whole as reported by IBGE. Between January and November 1986, the level of employment grew around 8% in all segments of the labor market.

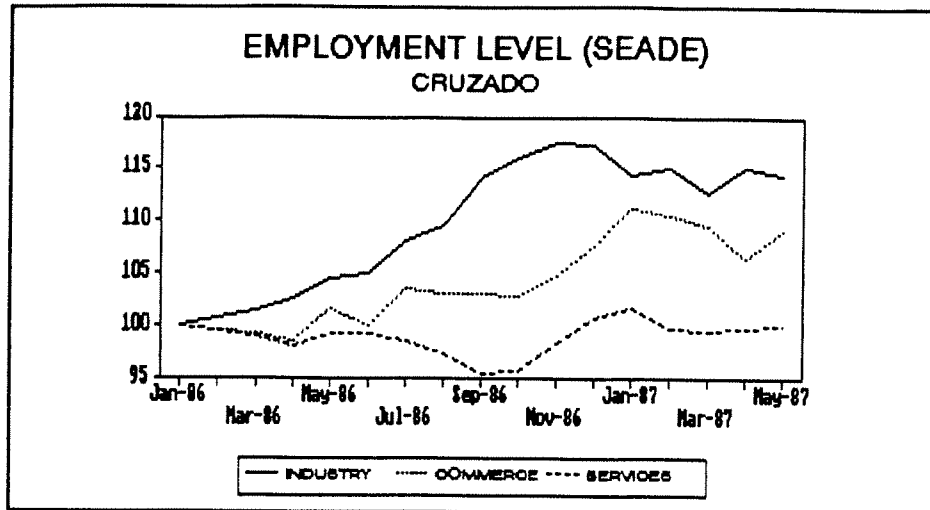


Figure 9a

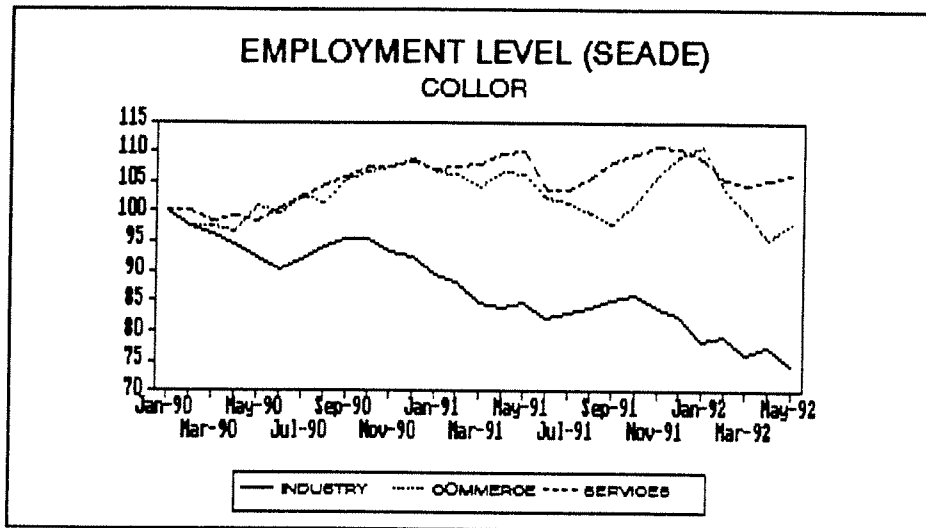


Figure 9b

The Collor plan is the mirror's image of the Cruzado plan. Unlike the case of the Cruzado, in the Collor plan, aggregate demand was deliberately contained to curb inflationary pressures,

the price freeze (in the Collor I phase) was not really credible, and the wage policy not only changed many times (creating uncertainty) but never really warranted the full protection of wages against inflation. As a consequence, the target real wage fell during the years 1990-92 due to the severe recession but, on the other hand, there were incentives to maintain a high indexation factor due to the uncertainty concerning the path of real wages over the future.

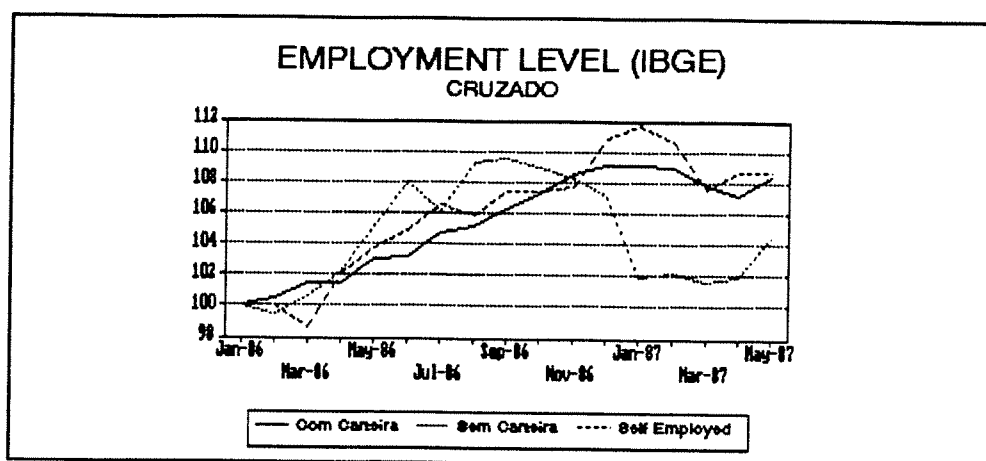


Figure 10a

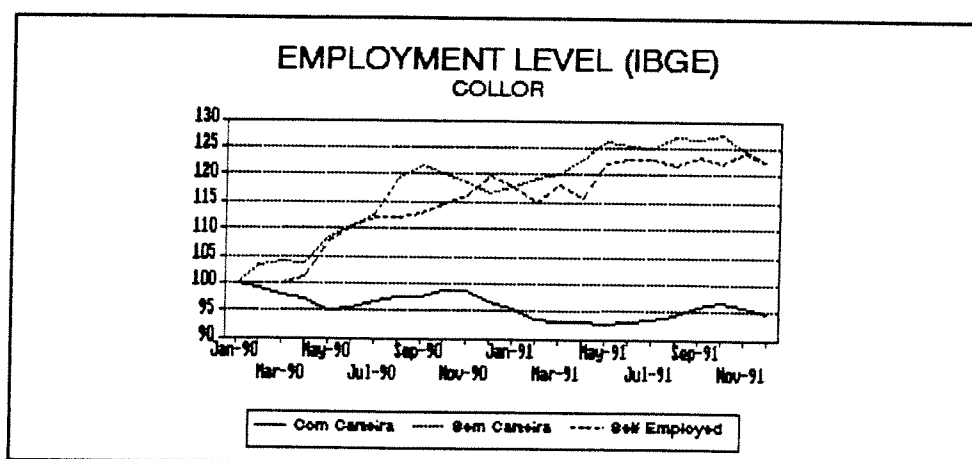


Figure 10b

In the modern industrial sector, the target wage did not fall

fall very much with firms keeping the wage of those workers who remained employed indexed to past inflation. In certain industries, there were periods in which wages were clearly over-indexing past inflation. However, open unemployment and hidden unemployment in the form of precarious work grew considerably while real wages of illegal and self-employed workers fell as never before in recent times.

As shown in figure 6b, real wages in the industrial sector remained almost constant while the wages of the legal, illegal and self-employed workers fell more than 30% in two years. The rigidity of real wages in the industrial sector results from the fact that firms do not want to widen the dissatisfaction gap of their 'core' workers. For those workers who remained employed, the real wage did not change much.

As shown in Figure 7b, the rate of open unemployment increased from 3% to 7% between January 1990 and March 1992 according (IBGE-Brazil) and from 5% to 10% in the great São Paulo area (SEADE-SP). Figure 8b shows that during the recession, the level of employment of wage earners in São Paulo fell approximately 15%, whereas the number of self-employed grew 15% up until January 1992. Figure 9b shows that in the great São Paulo area, employment in the industrial sector fell almost 25% increasing slightly in the commerce and services sectors. Over the same period the levels of employment increased around 25% in the illegal and self-employed segments whereas the level of employment of legal wage earners fell around 5% (Figure 10b). These are all strong evidences that during the recession workers migrate from the legal/wage earners segment to the illegal/self-

employed segment.

### VII. Concluding Notes

The Cruzado Plan failed in part because it relied exclusively on the price freeze which had an important effect on the formation of prices and wages in the modern industrial sector but had an insignificant effect on the other sectors. Aggregate demand contraction is certainly an efficient instrument to control the formation of prices and wages in the more competitive service and commerce segments of the goods market and the illegal and self-employed segments of the labor market. The Collor Plan (II), on the other hand, relied exclusively on demand contraction and, as a result, had a strong impact on the pattern of price and wage formation outside the modern industrial sector. Where the relation between capital and labor is relatively independent from market conditions, the effect on the real wage and the profit margin is virtually negligible.

Real wage rigidity and profit margin rigidities are certainly the causes for the stabilization of the rate of inflation around 20% between October 1991 and July 1992.<sup>10</sup> The recession seems incapable of bringing down the rate of inflation. Meanwhile, the rates of unemployment (open and hidden) have never been so high, and the levels of remuneration of workers in the illegal and self-employed segments of the labor market have never been so low.

The recession will not reduce inflation in the modern

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<sup>10</sup>. See Blanchard & Fischer (1989, chap. 9) for a survey of the literature on profit margin rigidity.



industrial sector. Our analysis suggests that, as far as the determination of money wages is concerned, a credible reduction of the level of expected inflation together with a wage law which could protect wages against inflation spurs, are required to promote a deindexation of wages in the modern sector of the economy. The government should act in order to gradually reduce the degree of indexation of wages and prices as well as public tariffs and the exchange rate. This could only be achieved through some kind of concerted incomes policy.

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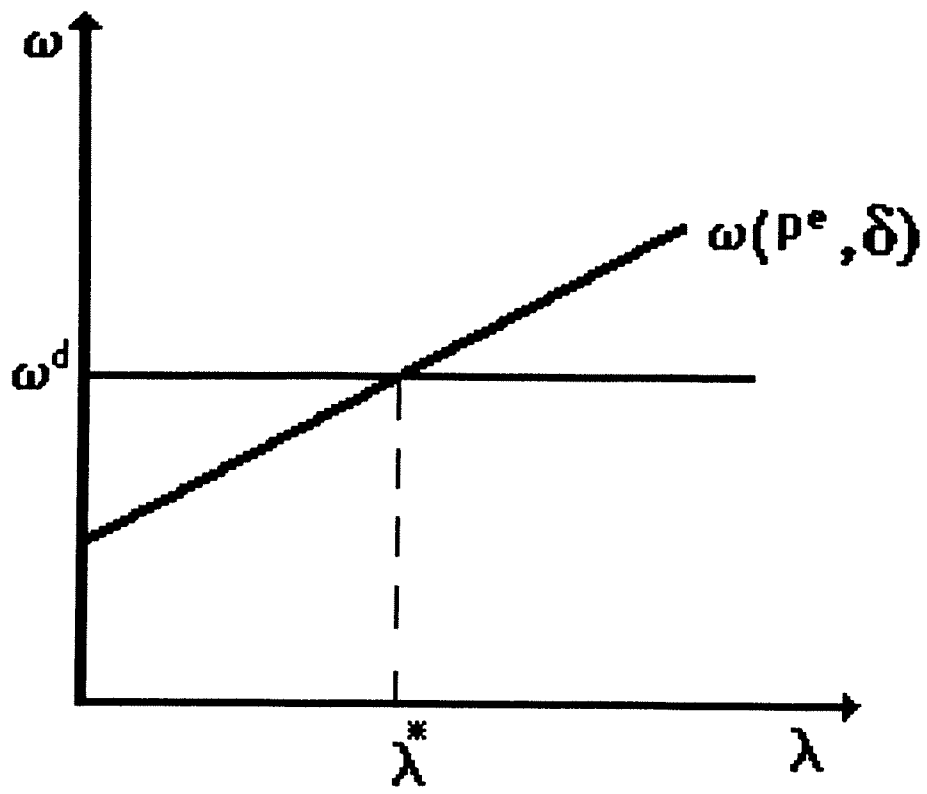


Figure 5

**Abstract:**

In the paper we compare the impact on the labor market of two recent stabilization plans in Brazil, namely, the Cruzado and Collor Plans. The main conclusions are the following: The Cruzado Plan failed in part because it relied exclusively on the price freeze which had an important effect on the formation of prices and wages in the modern industrial sector but had an insignificant effect on the other sectors. The Collor Plan, on the other hand, relied exclusively on demand contraction and, as a result, did not have any significant effect on the pattern of wages and prices in the modern industrialized sector.

**Resumo:**

No trabalho comparamos o impacto sobre o mercado de trabalho de dois planos estabilização no Brasil, o Plano Cruzado e o Plano Collor. As principais conclusões são as seguintes: O Plano Cruzado falhou em parte porque se baseou quase exclusivamente no congelamento de preços que teve efeitos importantes na formação de preços e salários no setor industrial moderno mas um efeito pouco significativo nos demais setores. Ao contrário, o Plano Collor, se baseou na contração da demanda agregada, e por isto, não teve efeitos significativos sobre o padrão de formação de preços e salários no setor industrial moderno.

Textos para Discussão:

275. Amadeo, E.J. "A model of wage over inflation"
276. Amadeo, E.J. ; Camargo, J.M. ; Marques, A.E.S. ; Gomes, C. "Fiscal crisis and assymetries in educational system in Brazil"
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