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Reflections on the Brazilian Experience with Indexation

|I| INTRODUCTION

The Brazilian experience of learning to live with inflation is studied by economists all over the world as an example of successful use of "inflationary correction"[1] to minimize the distortions associated with inflation. Some of the results of this experience of stabilization while maintaining growth, which began in 1964, are meaningful indeed. Inflation declined from an annual rate of approximately 100 percent at the beginning of 1964 to one fluctuating between 15 percent and 20 percent in 1973. At the same time, the rate of growth in real output remained over 9.5 percent after 1968, and the volume of foreign trade went up substantially; the value of exports increased from about 1.5 billion dollars a year to something over 7 billion at the end of the 1964–1973 period.

When the Brazilian program of stabilization began, several factors caused distortions that prevented the economy from performing better. First, with an accelerating inflation, the government adopted as a general policy the practice of fighting inflation by freezing the prices of some goods and services (agricultural products, transportation, electricity, etc.) for long periods of time. This led to two inevitable consequences: (1) it

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reduced the rate of return on investment in these areas and (2) it increased the need for government subsidies to the public enterprises that produced some of these goods and services, thus causing the government deficit to rise.[2]

Setting a 12 percent per year ceiling on interest rates (the so-called "usury law") had highly negative consequences. It damaged the efficiency of the financial market, which was thus restricted to commercial banks and to a parallel market characterized by a high degree of risk and inefficiency, with the result that interest rates were too high for borrowers and too low for lenders.

Since the rate of exchange was kept constant for long periods of time and the internal inflation was very different from the external one, there were important variations in the relative prices of export goods. As imports were restricted by quantitative controls and extremely high tariffs, the rate of exchange was kept overvalued. The variations in relative prices and the overvaluation of the exchange rate limited the development of exports, thereby shelving the external sector as a dynamic force in the process of economic development.[3]

Tax collections declined as a proportion of total output, partly because taxes were fixed in nominal terms (not as a proportion of production) and partly because the inflation stimulated a delay in payments, reducing still further the capacity of the tax system to capture resources.[4]

The numerous distortions that only far-reaching reforms could reduce or eliminate, the government's interest in reducing the inflation rate with the least possible social costs (in terms of reduced growth rate of real output), and the lack of economic policy instruments made it necessary to adopt a gradualist strategy in fighting inflation.

The three main goals of economic policy were:

1. to reduce in the shortest possible time the existing distortions in the economy so that the price system could once again operate as a more efficient mechanism for allocating resources;

2. to promote a set of reforms to improve the existing instruments of economic policy and to create others which could serve to reach the various goals;

3. to gradually reduce the inflation rate while minimizing the social costs normally involved in the shock treatment, and, as soon as the inflation rate was reasonably under control, to resume a development policy designed to maximize the growth rate of real output.

Unquestionably, the mechanism of inflationary correction, begun in 1964, was an essential element for the success of the stabilization policy. Its introduction into the Brazilian economy was not accomplished at once; in fact, the mechanism is still in the process of being adopted, by trial and

error. Nor can we speak of a universal system of indexation. However, we can point out the areas where it is most effective: (1) the financial market, where indexed bonds of short- and long-run maturity were issued by the National Treasury and the National Housing System, with inflationary clauses also covering saving and time deposits; (2) the wage policy, under which the government annually fixes the rate of change of minimum wages for different kinds of workers; (3) the foreign exchange market, where a system of minidevaluations has been followed; and (4) in the area of some administered prices (of public utilities, rents, etc.).

In all these cases different indexes and criteria of indexation were adopted. A wide range of financial markets which are not indexed still exists, such as bills of exchange, and in the price control system, which includes some of the largest enterprises in the country, price adjustments are made following a very informal procedure.[5]

Although the inflationary correction was an important element in the anti-inflationary policy, we feel that it would be a mistake to give it all the credit for the success of Brazil's recent economic performance. That was due mostly to a better assignment of the available policy instruments to the various objectives. A learning process was followed to achieve better use of the different instruments; in some cases the creation of new ones was necessary.

The debates concerning the advantages of indexation are far from leading to a definitive conclusion. It has been frequently argued that the system has serious shortcomings, and that with it we shall end up in a worse position than with leaving inflation unchecked.

The first controversy has to do with the application of the inflationary correction to factor markets. It is assumed that it would produce a much more stable aggregate supply of goods and services, minimizing costly fluctuations of output and employment during the stabilization process. But as the inflation rate becomes much more inflexible downward, the adjustment period toward price stability becomes longer.[6]

There are at least three points to be discussed in connection with the preceding argument. First, if in fact the indexation of factor markets stabilizes the aggregate supply, the cost of the stabilization policy would be reduced. The second point deals with the government's collection of the inflation tax. If indexation reduces the revenue from that tax, we would have an additional factor toward the reduction of stabilization costs. Finally, since expectations can be adjusted faster with indexation than without it, and expectations about future inflation are an important element in determining its actual rate, indexation introduces a destabilizing element into the growth rate of prices.[7]

In any economy the adjustment during the stabilization period is carried out partly through prices and partly through real income. Real income

fluctuations derive from the fact that, due to information costs, it is difficult to anticipate future price behavior. If prices rise faster than expected there will be an overemployment of factors, with a simultaneous rise in the inflation rate and real product; this is usually known as a demand inflation. On the other hand, since expectations about the price level are inflexible in the short run, under a successful government stabilization policy actual price increases will be below expectations. In this case we would have underemployment of factors, together with inflation and a reduction in the growth rate of output or even in its level.

The use of indexation would stabilize the level of aggregate supply by reducing or eliminating the divergence between actual and expected prices. Output and prices would behave as predicted by the classical macroeconomic model. This argument has been used in favor of adopting inflationary correction in the factors markets,[8] but stabilization of the aggregate supply is not the only justification for indexing. Let us also look at the actual behavior of the inflation rate and the anti-inflationary policy of the government.

First, as the returns in the area of information are higher the larger the variance of prices, more resources tend to be utilized in information gathering and less in true productive activities. Second, with the general application of policies designed to suppress inflation, some prices, as well as exchange rates, wages, tax rates, etc., are frequently readjusted, implying changes in relative prices and a loss in the allocative efficiency of the economy.

While indexing can reduce or eliminate all of these distortions, it must be pointed out that it involves difficult practical problems, as for instance, what price index to use.

In order to utilize indexing, the government must decide to forego its inflation-derived revenue, since generalized indexing reduces tax revenue. That is so because the real money stock will fluctuate much less with indexing than without it, and money stock is an important element in determining the tax revenue from inflation. Moreover, with indexed bonds the government transfers to the public part of that revenue. Finally, the knowledge that such a tax exists and that there are ways to avoid paying it puts pressure on the government to have interest paid on the compulsory reserves of the banking system and to index tax rates in order to avoid increases in the real progressivity of the tax system. This kind of pressure will increase, since the share of tax revenue from inflation that accrues to the banking system is declining. This is so not only because the tax rate is diminishing (without compensation in the tax base) but also because now banks have to pay interest on time deposits, so that the public receives the part of the tax that was internalized by the banks in the pre-indexing period.[9]

Looking at indexing and the feedback of inflation, we have to deal with two arguments. First, since in the short run the expected rate of inflation is the dominant factor in determining the actual rate, an inflationary correction that is very frequent can feed back into price rises. This feedback can operate in different ways—by reducing the difference between expected and actual rates of inflation, and by causing individuals to get rid of money because of the rise in the inflation rate. This could conceivably generate an explosive course of inflation.

This type of feedback can be alleviated by using inflationary correction with an optimal frequency, supported by a battery of price guidelines. In this way the behavior of the various economic agents could be made compatible with the anti-inflationary objectives.[10] We believe that essentially this is the system that operated in Brazil, allowing a reduction in the rate of price increases. To explain why inflation did not decline at a faster rate or did not reach lower levels we must primarily look at the behavior of the money supply and not at the feedback caused by indexing. The faster growth rate of prices after the second half of 1973 and during 1974 is mainly due to a rise in the money supply.

The second controversy in indexing concerns its effects on capital markets. Possibly one of the main results of indexing in Brazil is its positive contribution to the organization of a true financial market. Before indexing, this market operated in a way similar to commercial banks and was more or less informal and inefficient. Since indexing reduces unplanned transfers between lenders and borrowers, some financial instruments, nonexistent before, were thus finally introduced.

Some people point out that most of the savings and financial assets generated by the new system are captured by the government, which has a monopoly regarding those resources. This would have the effect of reducing their mobility, creating an excess supply of funds in some activities and an excess demand in others.

The main sources of savings garnered by the government are (1) the assets freely negotiated in the market as indexed Treasury bonds (yielding resources for investment in the housing market) and (2) compulsory savings schemes—the social security system, or FGTS; the social integration program, PIS. a mechanism similar to a profit-sharing scheme; and the program of assistance to public servants—PASEP (a program similar to PIS covering the public sector). The resources acquired through the social security system are linked solely to the housing market, while those from the other two sources are lent to firms for investment purposes. The National Housing Bank manages the FGTS, the Banco do Brasil operates the PASEP, and the PIS, formerly managed by the National Savings Bank, is now under the control of the National Bank of Economic Development. Although the banks have a monopoly on them, the National Monetary

Council (set up by the Banking Law of 1965) tried to increase the mobility of these resources. Every time there was an excess supply of funds in one agency and excess demand in another, the Monetary Council would sell ORTN (maintaining the financial profitability of the fund) to the financial institution with excess supply and would buy a corresponding amount from the one with excess demand.

During the period under review, a larger fraction of assets held by the public was in the portfolio of the private investment banks, commercial banks, and finance companies. It can be shown that, when double-counting is eliminated, the private sector is still the most important channel through which resources are accumulated in the Brazilian economy.

It is worthwhile noting that part of this increase in asset holdings is a purely statistical phenomenon: before the institutional change a parallel financial market was in operation, whose holdings were not included in the statistics. (It is impossible to get an accurate idea of the magnitude of that market.) At any rate, the flow of savings channeled through financial instruments does represent a substantial fraction of total private savings in the country.

Another critical issue under debate has to do with wage corrections. It became important for two reasons. First, in the starting phase of the Brazilian stabilization program (between 1964 and 1969) real wages generally fell, indicating that the wage policy was utilized as an instrument for stabilization and growth. Second, when the data from the 1970 census came in it became clear that personal income distribution had worsened in the last decade, and the government's wage policy was considered one of the main causes of this trend. One must be careful to clearly distinguish between these two phases: prior to 1968 real wages did, in fact, fall, while after 1968 the minimum wage policy was used only to put a floor under wage contracts. This allowed wage increases above official levels whenever there was excess demand in labor markets.

However, no matter what the true causes of wage increases after 1968 were, it cannot be denied that (1) the minimum wage does not represent a correct indicator of the behavior of wages in Brazil since the minimum wage policy was not always effective; (2) real wages generally rose in the period; and (3) the rise in real wages occurred at the time the economy began to grow faster, indicating that it was the market and not the government's formula that commanded wage increases in the country.[11]

Finally, it must be admitted that the Brazilian export promotion system was initially linked with the introduction of the minidevaluation scheme. In fact, it was a prerequisite for it. But the effects of tariff reduction and the increase in fiscal export incentives must also be considered. The minidevaluation system did reduce the variance in the relative prices of exports, an important risk element that had been discouraging investment

in the export goods sector. Lower tariffs increased the demand for imports, higher fiscal incentives, the supply of exports, the two together resulting in more trade. The expansion in exports was characterized by a sizable diversification, and there was an improvement in the country's terms of trade because of a strong demand for our products in international markets.

During most of this period, given the path of the cruzeiro devaluations, internal nominal interest rates were higher than the external ones. We find that although there was a deficit on current account, due to the overvaluation of the cruzeiro (which contributed to raising domestic savings), there was a surplus in the balance of payments, with the net inflow of capital attracted by the high domestic interest rates. Occasionally the accumulation of external reserves became a problem in monetary policy management.

To sum up, one cannot credit the minidevaluation policy with all of the expansion in international trade. Rather, it was the result of a broad general commercial policy supported by the exchange policy.

Since there are many papers available on the subject,[12] this one will not deal with the history of indexing in Brazil, nor with the extent of its actual application. Instead, it will discuss the topics explored above, many of which are interrelated, as outlined below.

In section two, we analyze the revenue from the inflation tax and the dynamics of inflation in the period prior to indexing. A model is introduced to show that expectations are the prime factor in determining inflation in the short run, but that money supply is the most important determinant over the long run. We conclude that without indexation, without the utilization of the fiscal policy to collect resources for the government, leaving monetary policy for stabilization purposes, it would have been impossible to reduce the inflation rate in Brazil. Section three describes the institutional reforms introduced in order to improve the allocation of resources, and shows that the stabilization process began when fiscal policy became responsible for the increases in government revenues, and monetary policy, for the stabilization goals. The inflation tax burden is estimated, and the conclusion is reached that at the end of the period all of the revenue was transferred to the public. We also show how indexation increases the degrees of freedom in the management of monetary policy. Section four deals with the relation between indexation and the capital markets, and section five discusses the effects of the minidevaluation policy on the expansion of Brazil's international trade.

[II] INFLATION AND THE INFLATION TAX BEFORE 1964

Before 1964, Brazil's inflation can be essentially attributed to the inept application of fiscal and monetary tools to attain two goals simultaneously:

price stabilization and the mobilization of resources to finance government expenditures at a time when taxation could not be used effectively.[13] To attain these two goals, the government should have utilized tax policy to increase government revenues, leaving monetary policy free to take care of price stabilization.[14] Due to the lack of tools capable of sterilizing the monetary expansion caused by fiscal deficits and the unwillingness or inability to increase taxation (which would have been quite unpopular), the monetary and fiscal instruments could not be used independently. This made it impossible to attain the two goals simultaneously.

During the whole of this period the government was deeply involved in a development policy that gradually increased investments in infrastructure. At the same time, to diminish inflation it held constant the prices of public services, which generated extra deficits in the public companies producing those services. These two reasons added to the fiscal deficit, and, unable to increase taxes, the government had to print money. The final result was an increase in the rate of inflation to the point of hyperinflation in the period between 1963 and 1964.

In this section we show that there existed simultaneously a very strong tendency to increase the money supply as a way of collecting a substantial amount of resources over and above the ones derived from the regular tax system—and to reduce the rate of increase in the money supply, which would generate, at least in the short run, a significant loss of resources.

If the government has a monopoly in the creation of money, the entire money supply will be purely high-powered money, and the government revenue from money creation, as a proportion of GNP, will be

$$(2.1) \quad R = \hat{M} (M/Py)$$

where a circumflex accent over a variable indicates its percentage rate of change, M is the nominal stock of money, P, the general price level, and Y, real output.

By definition, $\hat{M}$ is equal to the rate of inflation, π, plus the rate of change in the real stock of money ($\hat{m}$). This means that the tax revenue from inflation can be expressed as

$$(2.2) \quad R = (\pi + \hat{m}) (M/Py)$$

If there is a private banking system, the government will share with the commercial banks in the tax revenue from inflation. Using k for the money multiplier, the government will receive a proportion $(1/k)$ of the total revenue. The private sector, including the banking system, will get the remainder of the inflationary revenue. If the commercial banks can adjust the rate of interest for loans to the level of the rate of inflation, keeping the rates of interest on deposits equal to zero, they will internalize $(k-1)/k$ of the total revenue.

Empirical evidence for Brazil and a series of other Latin American countries shows that an increase in $\hat{M}$ from a constant level $\hat{M}_0$ to another $\hat{M}_1 > \hat{M}_0$ will not show its full impact on the rate of inflation at the very moment that it occurs. π adjusts to the new equilibrium level with fairly long lags.[15] This shows that the inflation tax is a very peculiar one—when $\hat{M}$ grows, the revenue increases in the short run for two reasons: because $\hat{M}$ increases, and because initially real cash balances also increase with the growth of $\hat{M}$. From (2.1) we obtain

$$(2.3) \quad \frac{dR}{d\hat{M}} = \hat{M} \, \frac{d(M/Py)}{d\hat{M}} + (M/Py)$$

which is positive because in the short run both terms on the right-hand side are positive.

In equilibrium the actual rate of inflation will be equal to the expected one ($\pi = \pi^e$), if we assume that the money market is also in full equilibrium (of stocks and flows), and ii, for reasons of simplicity, we neglect the changes in real income, we will have $\dot{m} = 0$. Then from (2.2) we get:

$$(2.2)' \quad R = \pi^e (M/Py)$$

Taking the derivative of this function for alternative values of π^e that satisfy the equilibrium conditions in the money market, we get:

$$(2.4) \quad \frac{dR}{d\pi^e} = \frac{\pi^e \partial(M/Py)}{\partial\pi^e} + (M/Py) \gtreqless 0$$

depending on $\eta_{m,c} = [\pi^e / (M/Py)] \cdot |\partial(M/Py) / \partial\pi^e| \gtreqless 1$, where $\eta_{m,c}$ is the cost elasticity of the demand for money.

As we know from empirical evidence,[16] $\eta_{m,c}$ is proportional to the rate of inflation, therefore the cost elasticity may be greater than, lower than, or equal to one. Depending on the level of the rate of inflation, an increase in π, in full equilibrium, may generate an increase, a constancy, or a reduction in tax revenue from inflation.

We also know that in full equilibrium revenue only declines for very high rates of inflation, and that for more "reasonable" values of π, $\partial R/\partial\pi$ will always be positive. In any case, there will always be an incentive toward inflation in the short run, although for the long run the incentives may be nonexistent. This may explain the fairly widespread tendency to use inflation as a way of mobilizing resources.[17] But it is also an argument to explain why there is a strong resistance to stabilizing π. If current expenditures are inflexible downward and the options to use other taxes are small, a sharp reduction in $\hat{M}$ will imply, at least in the short run, a decision to cut investment expenditures.

Under this set of conditions, stabilization can only be started if (1) there is an improvement in the success of fiscal policy, both in increasing revenues and in cutting expenditures, and/or (2) the government issues bonds capable of sterilizing the expansionary effects on M of the continuing fiscal deficit. Both measures depend crucially on indexation, particularly in economies facing rates of inflation as great as Brazil's.

At this point it is important to evaluate the dimensions of the inflation tax in Brazil during the period in which inflation was accelerating, and examine the course of tax revenues from inflation during the periods of adjustment immediately following a sharp change in $\hat{M}$.

The model used here is explained in greater detail in another paper by the authors.[18] Here we concentrate only on the essence of the argument, with some simplifications that will not change the nature of the results.

Let us assume first that the long-run demand for money is a stable function of real income and the cost of holding money, that is

(2.5) $\mu^d = -\alpha\pi^e + \beta z$

where μ^d is the logarithm of the desired real stock of money, π^e is the expected rate of inflation, and z is the logarithm of real output.

The adjustment equation for the real stock of money is given by

(2.6) $d\mu = a(\mu^d - \mu) + b(\hat{M} - \hat{M}^d) + d\mu^d$

where d indicates a derivative with respect to time (i.e., $d = d/dt$), μ is the logarithm of the actual nominal stock of money, and M^d is the desired nominal stock of money (ln $M^d = \mu^d$). This equation indicates that the actual change in the real stock of money (the left-hand side of the equation) is equal to the desired change (the right-hand side), and that this desired change is the sum of three effects.[19] The first term on the right-hand side is the "stock disequilibrium effect." It is assumed that whenever the desired real stock is greater than the actual stock, individuals will attempt to change the actual stock in such a proportion that the final total will be 100 percent of the stock they desire to accumulate.

The second term on the right-hand side measures the "shock absorber" effect. If individuals wish to increase their nominal stock at a rate $\hat{M}^d$, but monetary authorities create money at a rate $\hat{M}$ greater than $\hat{M}^d$, for example, individuals will initially keep a proportion of that excess in their real stock. This behavior derives from the fact that money is above all a transactions instrument that can be exchanged for any other asset or good; thus, until a decision is made regarding the allocation of these additional resources, it is better to maintain them in the form of money. This component of the adjustment of the real stock of money is short-run by its very nature and, therefore, the longer the period considered, the less importance it will have. Thus, when the period of analysis is short enough

we expect b to be fairly close to 1. In the long run b ought to be zero, and for intermediate periods the value of b should vary between 0 and 1.

The last term on the right-hand side represents the growth effect. If μ and μ^d were initially equal and grew at the same rate, we would have $\mu = \mu^d$ continually. If M^d and $\dot{M}$ were also equal, we would have $\hat{M}^d = \dot{M}$ continually. In such a case, individuals would accumulate money according to the rate of change in the desired stock, that is, $d\mu^d = d\mu$.

The third equation is simply the definition of the rate of inflation, given by the difference between the rate of monetary expansion and the rate of change in the actual stock of money:

(2.7) $\pi = \dot{M} - d\mu$

We will finally assume that the expected rate of inflation follows the adaptative expectation model proposed by Cagan (1956)

(2.8) $d\pi^e = c_1 (\pi - \pi^e)$

The demand for money in nominal terms is given by

(2.5)' $\ln M^d = -\alpha\pi^e + \beta z + p^e$

where p^e is the logarithm of the expected level of prices. From (2.5) and (2.5)',[20]

(2.9) $d\mu^d = -\alpha d\pi^e + \beta dz$

(2.10) $\hat{M}^d = d\mu^d + dp^e = d\mu^d + \pi^e$

tell us that the growth rate of the desired nominal stock of money is given by the expected rate of inflation (the rate at which the desired real stock depreciates) plus the growth rate of the desired real stock (the growth effect). Using relations (2.6), (2.7), (2.9), and (2.10), we arrive at the reduced form:

(2.11) $\pi = (1-b)\dot{M} + b\pi^e + \alpha(1-b)d\pi^e + a(\mu-\mu^d) - (1-b)\beta dz$

which can be interpreted as the aggregate demand curve on the $\pi-\dot{Y}$ plane.

On the assumption that the money market is in stock equilibrium ($m = m^d$, where m and m^d are the actual and desired stocks of money, respectively, i.e., $\ln m = \mu$ and $\ln m^d = \mu^d$) and that the rate of inflation has been constant for a period of time long enough for expectations to be adjusted, that is, $\pi = \pi^e$, equation (2.11) reduces to

(2.12) $\pi = \dot{M} - \beta dz$

or the traditional quantity equation. Equation (2.12) can also be derived from stock equilibrium in the money market.
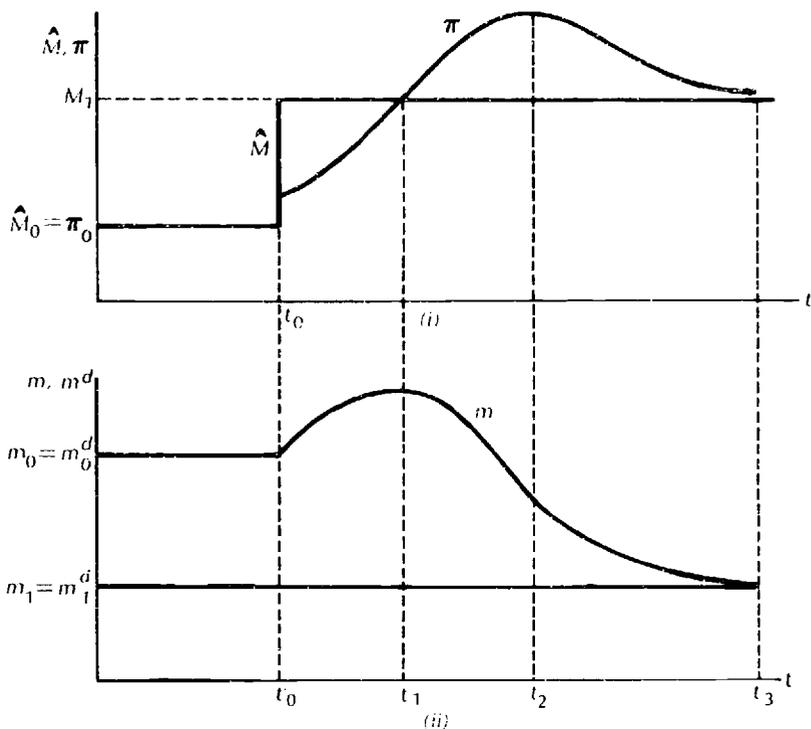
FIGURE 1   Hypothetical Paths for $\hat{M}$ and π and for m
and m^d

This means that in the long run, when all the adjustments in the money market are complete, the rate of inflation will be equal to the rate of monetary expansion minus the product of the income elasticity of the demand for money (long-run) times the rate of increase of real product. However, in the short run, if $(1-b)$ is small, changes in the growth rate of the money supply will hardly affect the present rate of inflation, which will be maintained approximately at the expected rate.

Assuming the income level to be exogenous and constant $(dz = 0)$, the model determines the path followed by π and μ when the rate of monetary expansion changes from one constant level to a higher one.[21] This path is typified in Figure 1.

During this entire period, the inflation tax base will be growing; assuming that the "tax rate" also increases, there will be a continuous increase in tax revenue.

As m grows relative to m^d, individuals are induced to "get rid of the excess supply of monetary assets," raising the aggregate demand for goods and services and (due to the assumed constancy of real output) the general price level. After a certain period of time, the rate of inflation starts to accelerate, increasing the cost of holding money, reducing m^d and thus

adding new inflationary pressures. The moment that π overtakes $\hat{M}$, actual real cash balances start to decline, reducing the increases in aggregate demand for goods and services. The rate of inflation will necessarily overshoot $\hat{M}$ because the demand for money is negatively sloped with respect to the cost of holding money, and the only way to restore equilibrium (of stocks and flows) in the money market is to reduce m in order to make it equal to m^d.[22] In the long run, therefore, m will be negatively related to $\hat{M}$, but in the short run an increase in $\hat{M}$ will increase real liquidity in the economy.

While $\hat{M}$ is greater than π, (M/P) will be increasing and the same will occur with the tax revenue from inflation (between t_0 and t_1). When π overtakes $\hat{M}$, the base of the tax starts to diminish and the revenue to decline. But if the cost elasticity of the demand for money is smaller than one, at the end of the process (when full equilibrium is reached) revenue will be higher than at the previous equilibrium point. Not only will it be greater in the new equilibrium position, but the government will also internalize any extra revenue due to inflation during all of the adjustment period.

Let us now concentrate on evaluating empirically the order of magnitude of this revenue both in the full equilibrium case and in the transition toward equilibrium. In this section we deal only with total revenue, leaving for later the question of who appropriated the resources collected, before and after indexation.

Let us first take an approximation of the adjustment equation for finite differences as

$$(2.13) \quad \mu_t - \mu_{t-1} = a(\mu_t^d - \mu_{t-1}) + b(\hat{M}_t - \pi_t')$$

In (2.13) we substituted M^d for π^e, since the depreciation of the real stock is the dominant component of the shock absorber effect. The total growth effect given by $(1-b)(\mu_t^d - \mu_{t-1}^d)$ is also ignored in (2.13) because its empirical significance is very small.[23]

Substituting in (2.13) the demand for money (2.5), we get the reduced form

$$(2.14) \quad \mu_t = -(\alpha a + b)\,\pi_t^e + \beta a z_t + (1-a)\,\mu_{t-1} + b\hat{M}_t + \mu_t$$

where μ_t is the random variable attached to the model. In order to evaluate the sensitivity of the estimates to any kind of specification bias some alternative specifications were tried. Assuming that the shock absorber effect is nonexistent $(b=0)$, and that the expected rate of inflation is generated by

$$(2.8)' \quad \pi^e - \pi_{t-1}^e = c_1\,(\pi_{t-1} - \pi_{t-1}^e)$$

we get the following reduced form

(2.15) $\quad \mu_t = d_1 \pi_{t-1} + d_2 z_t + d_3 z_{t-1} + d_4 \mu_{t-1} + d_5 \mu_{t-2} + v_t$

where

$\quad d_1 = -\alpha a c_1, \; d_2 = a\beta, \; d_3 = -a\beta(1-c_1), \; d_4 = [(1-a)+(1-c_1)]$

and, finally,

$\quad d_5 = -(1-\alpha)(1-c_1)$

We can now impose a set of restrictions on the various coefficients of the model and evaluate which of the proposed specifications best predicts the demand for money in Brazil. (See Table 1.)

In the first equation of Table 1 we impose the restrictions, $b=0; a = c_1 = 1$. In the second equation we place no restrictions on a, estimating this coefficient in the model, but impose $b = 0$ and $c_1 = 1$. In the third one c_1 is estimated in the model, while we impose $b = 0$ and $a = 1$. In the fourth equation we impose only $b = 0$, and the last equation has no restrictions at all.

In all these specifications the coefficients are highly significant, but using the R^2 criterion, we find the last one is the one that best predicts μ_t. Also, the coefficient of $\hat{M}_t$ is highly significant, so that there are no reasons to reject the hypothesis that the "shock absorber effect" is present in the model.

The point estimate of c_1 in $(2.15)=C$ is $c_1 = 0.305$. In model $(2.15)=D$ it is not possible to obtain the estimates of a and c_1 (because the roots involve complex numbers, and we face the familiar problem of the "symmetry" of the roots in distributed lag models combining partial adjustment with adaptative expectations), but, since the coefficients of μ_{t-1} and μ_{t-2} are very close to 1.0 and -0.25, respectively, we do not reject the hypothesis that $a = c_1 = 0.5$. The point estimate of c_1 in the last equation was obtained by the iterative method used by Cagan (1956). The R^2 reached a maximum when $c_1 = 0.4$, but the likelihood ratio test does not reject the hypothesis that c_1 lies between 0.3 and 0.5. In the following analysis we use the estimate $c_1 = 0.4$.

Another interesting test is to compare the short- and long-run cost and income elasticities in various specifications together with the estimated values of α. Table 2 shows these results, demonstrating that, although the dynamic implications of each of those models is very different, the coeffi- cients are quite similar, which gives us more confidence in the estimates of the tax revenue from inflation in a situation of full equilibrium.[24]

Table 3 shows estimates of the inflation-derived revenue in a situation of full equilibrium. For quarterly rates of inflation of 5 percent per quarter, the tax revenue from inflation would be 4 percent of GNP. At inflation rates of 20 percent per quarter (approximately those observed in Brazil in the

TABLE 1 The Demand for Money in Brazil

Equation	$\hat{\pi}_t$	π_{t-1}	z_t	z_{t-1}	μ_{t-1}	μ_{t-2}	$\hat{M}_t$	R^2	Dw	Restrictions on the coefficients
(2.15)-A	—	-1.036 (6.040)	0.653 (21.114)	—	—	—	—	0.885	1.224	$b = 0$; $a = c_1 = 1$
(2.15)-B	—	-0.521 (4.412)	0.229 (4.840)	—	0.681 (9.779)	—	—	0.957	1.775	$b = 0$; $c_1 = 1$
(2.15)-C	—	-0.502 (3.883)	0.251 (3.337)	-0.032 (0.380)	0.695 (8.788)	—	—	0.957	1.770	$b = 0$; $a = 1$
(2.15)-D	—	-0.336 (2.240)	0.299 (3.882)	-0.094 (1.069)	0.976 (6.163)	-0.275 (2.032)	—	0.960	2.184	$b = 0$
(2.14)	-1.059 (5.917)	—	0.185 (3.342)	—	0.736 (9.391)	—	0.676 (4.953)	0.962	1.814	none; the estimate of c_1 was $c_1 = 0.4$ [a]

NOTE: The numbers in parentheses are t-values. All equations were estimated with ordinary least squares and all functions were estimated with a constant term, not shown in the table.

[a] The estimate of c_1 in (2.14) was obtained through the iterative method.

TABLE 2 Values of α and Money Demand Elasticities in Each Model

Equation	Income (short run)	Elasticity (long run)	Value of α	Cost (short run)	Elasticities[a] (long run)
(2.15)-B	0.229	0.718	−1.633	−0.047	−0.147
(2.15)-C	0.251	0.718	−1.646	−0.045	−0.148
(2.15)-D	0.299	0.686	−1.124	−0.030	−0.101
(2.14)	0.185	0.701	−1.451	−0.034	−0.131

[a]Cost elasticities were calculated with the average inflation rate of the period--9 percent per quarter.

period 1963–1964) the revenue goes up to 11 percent of GNP. Since the money multiplier was taking values around 1.5 and 1.6 in this period, the government was internalizing between 60 and 65 percent of total revenue.[25]

It is interesting, however, to simulate the dynamic path of revenue in the case of a once-and-for-all increase in $\hat{M}$, and to compare it with the case of a once-and-for-all reduction in $\hat{M}$.

In Table 4 we assume (strategy A) that the monetary authorities held $\hat{M}$ constant at the level of 5 percent per quarter until the economy reached the full equilibrium position, then increased it to 10 percent per quarter, and subsequently kept it constant at this new level. At the beginning of the adjustment process the revenue was 4 percent of GNP, and at the end, 8 percent of GNP. But in the quarter in which the growth rate of the money supply was increased, revenue jumped to 8.5 percent of GNP, staying above this level in the following four of five quarters and then settling to the new equilibrium position.

In Table 5, by contrast, we assume (strategy B) that the government decided to generate a once-and-for-all reduction in $\hat{M}$, initially at 20 percent per quarter, to 5 percent per quarter. In this case, the inflation revenue, initially 13 percent of GNP, would be equal to 4 percent of GNP when the new equilibrium is reached. But in the quarter when $\hat{M}$ is reduced, revenue falls sharply to 3 percent of GNP, staying around this level for some quarters ahead.

The lack of other instruments to mobilize resources obviously reduces the incentives to control the money supply. If we keep in mind that the private banking system internalizes a part of the total revenue, it is possible that a shock treatment will expose some banks at least to bankruptcy.[26] To the extent that indexation generates more degrees of freedom to manipulate monetary policy, it improves the possibilities for stabilization, a view that runs counter to the position that indexation tends to perpetuate inflation. Brazil could only engage in a serious stabilization program once policymakers became conscious of this fact and started creating new instruments capable of sterilizing the growth rate of money supply and of eliminating the inducement toward inflation for mobilizing resources.

TABLE 3 Government Revenue from Inflation

	Rate of Inflation (quarterly) $y = 196$				Rate of Inflation (quarterly) $y = 300$		
Inflation Rate (π)	Money Supply[a] (m^a)	Revenue (πm^a)	Revenue Income (R/y)	Inflation Rate (π)	Money Supply[a] (m^a)	Revenue (πm^a)	Revenue Income (R/y)
0.05	160.6	8.0	0.04	0.05	208.7	10.4	0.04
0.10	149.4	14.9	0.08	0.10	193.6	19.4	0.07
0.20	128.5	25.7	0.13	0.20	166.5	33.3	0.11
0.30	110.5	33.2	0.17	0.30	143.3	43.0	0.14
0.40	99.8	39.9	0.20	0.40	123.2	49.3	0.16
0.50	81.8	40.9	0.21	0.50	106.2	53.1	0.18
0.60	70.4	42.2	0.22	0.60	93.6	56.2	0.19
0.70	60.6	42.4	0.22	0.70	78.6	55.0	0.19
0.80	52.3	41.8	0.21	0.80	67.7	54.2	0.18

NOTE: m^a, y, and R are expressed in cruzeiros of 1953.

[a] Calculated with the relation (2.14), $c_1 = 0.4$.

TABLE 4 Government Revenue from Inflation, Strategy A

	μ	π	$\mu - \pi$	M/p (actual)	R	R/y
Initial equilibrium						
	0.05	0.050	0	160.6	8.03	0.040
	0.05	0.050	0	160.6	8.03	0.040
	0.10	0.066	0.034	166.1	16.60	0.085
	0.10	0.082	0.018	169.05	16.91	0.086
	0.10	0.097	0.003	169.6	16.96	0.087
	0.10	0.111	−0.011	167.7	16.77	0.086
Final equilibrium						
	0.10	0.10	0	149.4	14.90	0.080

TABLE 5 Government Revenue from Inflation, Strategy B

	μ	π	$\mu - \pi$	M/p (actual)	R	R/y
Initial equilibrium						
	0.20	0.20	0	128.5	25.7	0.13
	0.20	0.20	0	128.5	25.7	0.13
	0.05	0.15	−0.10	116.8	5.8	0.03
	0.05	0.10	−0.05	111.2	5.6	0.03
	0.05	0.06	−0.01	110.1	5.5	0.03
	0.05	0.03	0.02	112.3	5.6	0.03
Final equilibrium						
	0.05	0.05	0	160.6	8.0	0.04

[III] BRAZIL'S MONETARY POLICY AFTER INDEXATION

The discussion that started in 1964 was characterized by the orientation that inflation could only be controlled by reducing the rate of monetary expansion. This, in turn, could be achieved only through (1) a gradual reduction in the federal government's deficits and (2) an effective control over the expansion of credit to the private sector granted by the Banco do Brasil.

Convinced that it was primarily fiscal policy that had to be used to gain resources for financing government expenditures, the government started a new tax system and introduced the principles of inflationary correction to eliminate some of the distortions from the tax base.

For the first time, the government abolished the prohibition on charging interest rates above 12 percent a year; it also issued government bonds with interest rates corrected for inflation as one way to remove the expansionary pressure from the Treasury and the Banco do Brasil. The creation of the Central Bank introduced an important institutional reform, which allowed a more effective control over credit expansion by the Banco do Brasil.

The National Monetary Council was set up and became the institution responsible for coordinating economic policy. Previously this policy had been diffused and uncontrolled, particularly in the monetary and fiscal area, creating incompatibilities between goals and policy instruments and reducing their efficiency.

Until 1965 the activities of the Central Bank were exercised by the Banco do Brasil, which was simultaneously a commercial bank and the financial agency of the monetary authorities. It is true that since 1945 a government agency—Superintendence of Money and Credit (SUMOC)—had been in existence which was an embryo of the Central Bank, designed to direct monetary policy. But it lacked policy instruments, and, besides, the largest part of political power was always in the hands of the Banco do Brasil, which was free to manipulate its policy of applications without considering the effects on the expansion of the monetary base. As a commercial bank, the Banco do Brasil was not subject to reserve requirements, paid very low interest on rediscount, and had no limit imposed by SUMOC on its applications. As a financial agency of the government, it received taxes and made payments in the name of the Treasury. All this gave the Banco do Brasil considerable freedom to expand credit to the private sector.

After the reforms of 1965 the Banco do Brasil continued as the financial agency of the monetary authorities, but since it was under no obligation to keep reserve requirements, the Monetary Council started putting ceilings on its applications, to be approved periodically according to the planned monetary budget.

The Monetary Council was presided over by the economic minister and included the ministers of planning, agriculture, and industry and commerce, the president and director of the Central Bank, and the presidents of the Banco do Brasil and of the National Development Bank, Housing Bank, the Federal Investment Bank (Caixa Econômica Federal).

All issues relating to monetary policy, foreign exchange policy, price support policy, fiscal policy, interest rate policy, etcetera could only be

decided by this council. With the Council, thus, the center of all economic decisions, it became possible to make the management of the various economic instruments compatible so that the projected economic goals could be attained. Any interpretation of Brazilian economic policy after 1964 that does not pay due attention to the role of the Monetary Council in its direction loses all meaning.

Brazil's monetary base can be defined as the sum of the currency in the hands of the public, M_p, the deposits of the public in the Banco do Brasil, D^{BB}, and total (voluntary and required) reserves of all other commercial banks, R.[29]

(3.1) $B = M_p + R + D^{BB}$

We are going to assume the following three behavioral relationships:

1. The public wishes to hold a proportion h of the total money supply in the form of cash.

2. The ratio between reserves (voluntary and required) and total deposits in the commercial banking system (D^{BC}) is constant and equal to r.

3. The average propensity to deposit in the Banco do Brasil is constant and equal to g. That is:

$M_p = hM$; $R = r D^{BC}$, and $D^{BB} = g D$. where $D = D^{BB} + D^{BC}$

The money supply is defined as

(3.2) $M = M_p + D$

and the money multiplier is given by

(3.3) $k = \dfrac{1}{1 - (1 - h)(1 - r)(1 - g)}$

Then it is clear that

(3.4) $M = k B$

Figure 2 shows that the money multiplier varied in the period under analysis between approximately 1.5 and 2.0 and that the main source of monetary expansion was the behavior of the monetary base. This allows us to abandon any attempt to analyze the variables that determine the behavior of the money multiplier and to concentrate, instead, on the behavior of the base.

Table 6 shows the consolidated balance sheet of the monetary authorities from the standpoint of sources and applications. We define net loans to the government as the integral of the national Treasury's past deficit. Net credit to the private sector is the sum of direct loans of the Banco do Brasil to the private sector and the value of purchases of agricultural products under the policy of price supports, minus the deposits made for foreign exchange transactions.
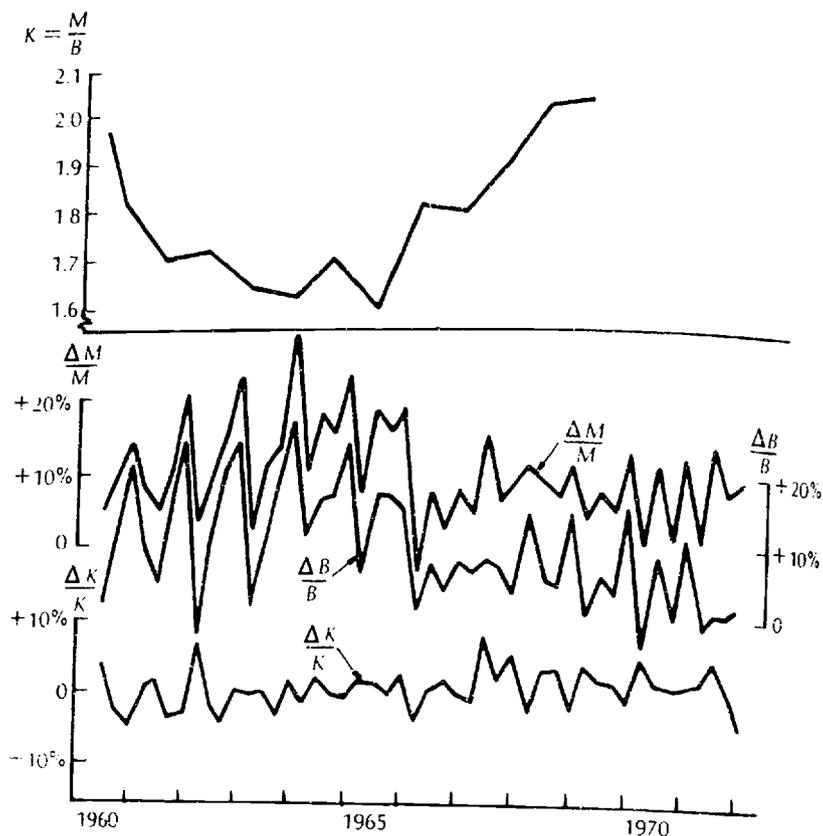
FIGURE 2 Behavior of Money Multiplier and the Sources of Monetary Expansion

Net foreign reserves are the result of purchases and sales of foreign exchange converted into cruzeiros at the exchange rate prevailing at the time of the transaction. Finally, bonds include all sales to the public of Readjustable Treasury Bonds (Obrigacões Reajustáveis do Tesouro) and Treasury Bills (Letras do Tesouro Nacional); therefore it excludes the bonds held by commercial banks as part of reserve requirements. These holdings have the effect of increasing the profitability of banks and are neutral from the point of view of the money supply.

Viewed from the application side, the monetary base is

$$(3.5) \quad B = C_g - T + L^{BB} + RD + L^A + F_r$$

where C_g is the net credit to the government, T, the balance of bonds held by the private sector, L^{BB}, loans of the Banco do Brasil to the private sector, L^A, the balance of loans to other government agencies, RD, the amount of rediscount, and F_r, the balance in cruzeiros of net balance reserves. All these data are presented in Table 7.

TABLE 6 Monetary Authorities: Consolidated Balance Sheet

Year	Cash Deficit (1)	Bond Sales (2)	Public Sector Loans[a] (3)	Rediscounts[b] (4)	Loans to Govt. Agencies (5)	Net Foreign Reserves (6)	Other Items (7)	M_E	D_p^{BB}	D_A^{BB}	R_c	R_v	Total
1960	159	— 21	235	10	13	7	30	148	39	46	34	56	373
1961	289	— 22	241	18	18	9	37	296	79	84	52	79	590
1962	528	— 45	468	31	19	9	65	478	127	99	111	130	945
1963	1,016	— 101	678	46	38	238	300	821	192	155	228	219	1,615
1964	1,733	— 52	949	127	94	615	492	1,389	405	420	409	351	2,974
1965	2,321	— 375	2,173	99	103	1,538	721	2,074	759	754	889	662	5,138
1966	2,840	— 879	2,955	266	162	1,452	320	2,741	933	1,037	989	826	6,526
1967	4,080	— 1,643	3,696	282	247	1,083	473	3,458	1,466	972	1,494	828	8,218
1968	5,407	— 1,791	4,661	692	294	1,674	994	4,970	2,250	1,538	1,958	1,215	11,931
1969	6,163	— 3,572	6,726	825	357	4,277	721	6,213	3,171	2,176	2,032	1,905	15,497
1970	6,901	— 5,143	8,993	895	627	7,311	— 1,099	7,638	3,993	2,779	1,760	2,315	18,485
1971	7,537	— 9,179	15,003	2,284	501	11,407	— 2,790	9,498	4,848	4,055	2,322	4,040	24,763
1972	8,089	—16,505	19,653	3,003	589	28,261	—13,550	12,718	6,526	4,864	3,214	2,218	29,540
1973	7,794	—22,225	28,488	3,331	650	43,415	—17,902	18,713	9,836	7,926	5,323	2,383	43,551

[a] Includes CREGE, CREAI, support prices, coffee operations, previous deposits in exchange operations, loans through resolution 289, and swaps. From 1967 on, excludes revenue of the financial operations tax, and from 1968 on, includes BNDE, and from 1971 on, FUNAGRI and PASEP operations.

[b] Excludes rediscount to coffee operations.

TABLE 7 Annual Rates of Change of the Monetary Base and Its Components
(percent)

Periods	Treasury Cash Deficit	Bond Sales to the Public	Banco do Brasil Loans to Private Sector	Rediscounts (except coffee)	Loans to Public Agencies	Net Foreign Reserves	Other Accounts (net)	Base
61–60	.349	–.020	.017	.023	.013	.005	.182	.569
62–61	.404	–.038	.384	.022	.016	.000	–.170	.618
63–62	.516	–.058	.222	.015	.020	.229	–.245	.699
64–63	.444	.030	.167	.049	.034	.233	–.118	.839
65–64	.198	–.105	.411	–.009	.003	.309	–.075	.732
66–65	.110	–.096	.152	.032	.011	–.016	.077	.270
67–66	.181	–.116	.113	.002	.012	–.056	.121	.257
68–67	.161	–.018	.117	.049	.005	.071	.062	.447
69–68	.064	–.149	.173	.011	.004	.218	–.022	.299
70–69	.047	–.101	.146	.004	.017	.195	–.116	.192
71–70	.034	–.218	.324	.074	–.006	.221	–.090	.339
72–71	.022	–.295	.187	.028	.003	.679	–.432	.192
73–72	–.009	–.193	.299	.011	.002	.5126	–.147	.475

The contribution of each of these elements to the expansion of the monetary base is computed by

$$(3.6) \quad \frac{B_t}{B_{t-1}} = \left(\frac{C_{g_{t-1}}}{B_{t-1}}\right)\frac{C_{g_t}}{C_{g_{t-1}}} + \left(\frac{T_{t-1}}{B_{t-1}}\right)\left(\frac{I_t}{T_{t-1}}\right) + \left(\frac{L_{t-1}^{BB}}{B_{t-1}}\right)\left(\frac{L_t^{BB}}{L_{t-1}^{BB}}\right)$$

$$+ \left(\frac{RD_{t-1}}{B_{t-1}}\right)\left(\frac{RD_t}{RD_{t-1}}\right) + \left(\frac{L_{t-1}^A}{B_{t-1}}\right)\left(\frac{L_t^A}{L_{t-1}^A}\right) + \left(\frac{F_{x_{t-1}}}{B_{t-1}}\right)\left(\frac{F_{x_t}}{F_{x_{t-1}}}\right)$$

We can see that during this period the main sources of the expansion in B were L^{BB} and C_g. Starting with 1965, the sales of readjustable bonds to the private sector appeared as an important element in the sterilization of expansions in the monetary base. These sales compensated for the expansion in B caused by the entry of foreign reserves in 1965, and again from 1969 on. The government deficit declined continuously during this period up to 1973, when the federal government actually had a surplus. In 1966 the rate of expansion in the monetary base diminished because of (1) the loss of foreign reserves resulting from the constant upward valuation of the cruzeiro due to internal inflation without adjustment of the exchange rate and (2) the continuous reduction in the government deficit. In fact, 1966 is the year when Brazil experienced the sharpest monetary contraction of the first part of its stabilization program.

It is important to analyze the behavior of the government deficit during this period. (The relevant information is in Table 8.) Tax receipts, 9.4 percent of national income in 1964, increased gradually to reach 14.3

TABLE 8   Federal Government: Revenue and Expenditures (millions of cruzeiros)

Year	Revenue R	Expenditures C_T	Deficit D	As a Proportion of National Income R/y	G/y	D/y
1964	2,129	2,857	− 728	9.4	12.4	3.2
1965	3,907	4,499	− 593	10.6	12.2	1.6
1966	5,910	6,496	− 587	11.0	12.1	1.1
1967	6,814	8,039	−1,225	9.5	11.2	1.7
1968	10,275	11,502	−1,227	10.3	11.5	1.2
1969	13,953	14,709	− 756	10.5	11.1	0.6
1970	19,194	19,432	− 738	11.0	11.3	0.4
1971	26,980	27,653	− 672	11.6	11.9	0.3
1972	37,378	38,254	− 516	12.4	12.6	0.2
1973	52,863	52,568	+ 295	14.3	14.3	−0.1

SOURCE: Central Bank.

percent of national income in 1973. The reduction in these tax receipts in 1967 stemmed from the heavy monetary contraction of 1966 which generated the recession starting in the first quarter of 1967. To eliminate it the government reduced the fiscal burden imposed on firms by postponing the deadline for the payment of taxes. This policy had the effect of increasing the aggregate supply (because of the reduction in costs) of and aggregate demand (because of the increase in disposable income) for goods and services. Starting with 1969 we can see the results of the improvement in tax collection—the share of tax receipts in the national product increased substantially. Although government expenditures also increased, the deficit diminished continuously, and in 1973 there was a surplus. In part, this surplus was utilized as an additional instrument to sterilize the expansionist impact of capital inflows on the monetary base, since the sales of government bonds to the public had proved to be insufficient for this purpose. (This problem is analyzed in greater detail in the section on minidevaluations.)

Table 9 shows government receipts, current expenditures, and savings not only of the federal government but also of the states and municipalities. We can see that the savings of the public sector, which represented 22 percent of total receipts in 1965, increased during this period to reach almost 30 percent of total receipts in 1973.

The monetary base can be analyzed both from the assets and the liabilities side. When there is an increase in the government deficit, in net foreign reserves, and in the loans to the private sector by the Banco do Brasil, the applications of the monetary authorities increase and the monetary base $(B = D^{BB} + R + M_p)$ also increases.

The government's revenue from inflation is obtained from the holders of R, D^{BB}, and M_p, and the government share of this revenue is given by

TABLE 9   Government Savings: Federal, State, and Municipal (millions of current cruzeiros)

Year	Revenue R	Consumption Expenditures G	Savings S	S:R
1949	45.4	34.5	10.9	0.24
1959	449.7	351.4	98.3	0.22
1970	50,965.4	38,105.3	12,860.1	0.25
1971	67,164.3	48,728.2	18,436.1	0.27
1972	94,396.1	66,752.7	27,648.4	0.29
1973	132,055.4	104,164.9	27,890.5	0.29

SOURCE: National Accounts, Vargas Foundation.

(3.7) $\hat{\beta}\left(\dfrac{B}{\mu}\right) = \dfrac{1}{k}\hat{\beta}\,(M/P)$

When the government increases the supply of bonds, it reduces the expansion rate of the base, thus reducing inflationary pressures. A second problem is to find out who benefited from the inflation tax collected from the holders of the monetary base before and after the introduction of indexation. We can estimate this with the aid of the following expression:

(3.8) $\dfrac{A}{P} = \dfrac{D_e}{P} + i_T\dfrac{T}{P} + (i - i_L^{BB})\dfrac{L^{BB}}{P} + (i - i_Lx)\dfrac{L^Fx}{P} + (i - i_R)\dfrac{RD}{P}$

where D_e is the government deficit (the increase in loans to the government) and $i_t(T/P)$ is the flow of real income paid to the holders of government bonds. Let us suppose that $i = r + \pi^e$ is "the" equilibrium interest rate, given by the real interest rate plus the expected rate of inflation. Then the government transfers subsidies to the borrowers from the Banco do Brasil, given by $(i - i_L^{BB})(L^{BB}/P)$, since the interest rate charged by the Banco do Brasil was greatly subsidized before indexation. Loans obtained abroad (converted into cruzeiros at the moment when the foreign exchange was sold to the monetary authorities) include subsidies given by $(i - i_L^Fx)(L^Fx/P)$. Finally, the banking system that obtained rediscount loans at a subsidized interest rate received $(i - i_R)(RD/P)$, where i_R is the rediscount rate.

At the beginning of the period the stock of government bonds sold to the public was very small, so only a very small amount of the inflation tax was returned to the public through this mechanism. The share of the fiscal deficit in the increase of the monetary authorities' total assets was very high, which shows that the central government was internalizing a very high proportion of the total inflation tax. On the other hand, the Banco do Brasil was heavily subsidizing interest rates on loans, and the same was happening with rediscount rates. Finally, the fixed exchange rate system introduced a new source of subsidies. The loans generated by the inflow of foreign reserves were regulated by Instruction 289 of SUMOC. Through this "resolution" the monetary authorities were guaranteeing the sales of foreign exchange at the moment of the payment of the loan, but if between the contract of the loan and its repayment there happened to be an exchange rate devaluation, the exchange losses were paid by the monetary authorities. Under these circumstances i_L^Fx was simply the nominal interest rate in the international market.

The introduction of inflationary correction brought an increase in bond sales to the public and in the amount that the central bank had to pay to the public (and to the commercial banks, as we show in the next section). There is a reduction in the difference between i and i_L^{BB} because, despite the Banco do Brasil's subsidizing of interest rates on regular commercial

loans, the rate of interest becomes positive in real terms. Finally, together with the minidevaluations system, there is a change in the regulation of foreign loans, now governed by Instruction 63 of the Central Bank and by Law 4131. In both cases the central bank guarantees the availability of foreign exchange to repay the loan, but the exchange risk is now borne by the private sector.

The nominal interest rate on foreign loans (deriving from the Eurodollar rate plus the expected devaluation rate of the cruzeiro) was lower than the domestic interest rate (deriving from the real rate plus the expected rate of inflation). There were at least three reasons for this difference. First, the Brazilian growth rate (around 10 percent) was higher than in the rest of the world (a reason, according to general equilibrium theory, for Brazil's interest rate to be higher than in other countries). Second, the exchange rate was devalued more or less by discounting from the internal inflation rate that of the rest of the world, generating an expected devaluation rate lower than the expected inflation rate (once everybody believed that inflation in the rest of the world was not going to be zero).[30] Finally, since the government was using open market operations to sterilize the expansionary effect on M of the inflow of foreign reserves, the sales of bonds reduced their price, thus increasing relatively the domestic rate of interest (remember that interest rates on most loans are tied to the interest rates on ORTNs).[31]

In other words, the government always returned to the public a part of the inflation tax revenue. Before indexation, however, the beneficiaries of these receipts were the privileged debtors of the Banco do Brasil (with

TABLE 10 Distribution of the Inflation Tax Burden

Period	Monetary Base Average Change	Bond Yield $(i_T T)$	Subsidies to Borrowers $[(i - i_L^{BB})L^{BB} + (i - i_L^{Fx})F_x + (i - i_R)RD]$	Deficit (D)
1961–1964	650.3[a]	6.6[b] (0.010)	245.0[d] (0.377)	343.5[a] (0.605)
1969–1972	4,412.2[a]	2,281.8[c] (0.518)	1,057.0[e] (0.240)	670.5[a] (0.152)

[a] Data from Table 6.
[b] Includes the payment of interest and inflationary correction; source: Central Bank.
[c] Assuming that the interest rate was equal to 12 percent a year.
[d] Estimated with data on loans from Table 6, the average inflation rate in the period (17 percent yearly) and the Banco do Brasil interest rate (25 percent yearly).
[e] Assuming an average subsidy of 8 percent a year on loans $(L^{BB} + L^{Fx})$ and of 14 percent on rediscounts.

loans from both domestic and foreign resources). After the introduction of indexation, a certain margin of subsidies remained, but indexed bonds became the main source of the tax rebate.

To ascertain the size of the "burden" of this tax, we calculate the inflation tax "rebates" as a proportion of the flow of high-powered money. We take only two periods: the first, between 1960 and 1964, and the second, between 1969 and 1972. For results, see Table 10.

To sum up, in order to reduce the deficit and keep monetary expansion under control, the government has to pay a nominal interest rate (a positive real rate on bonds) and return to the public a substantial proportion of the inflation tax. Fiscal policy is used more effectively as a way to mobilize resources. It all points to a reduction in the pressure to inflate, and to a better utilization of fiscal and monetary instruments for both mobilizing savings and stabilizing prices.

[IV] THE ROLE OF FINANCIAL ASSETS IN CHANNELING SAVINGS

There are at least four questions demanding a special analysis in this section: (1) How has the new system of "forced savings" based on inflationary correction operated? (2) How did the National Monetary Council utilize the indexed bonds to transfer funds from financial institutions carrying a surplus to those carrying deficits? (3) How were indexed bonds used to increase the profit rate of the private banking system when bank revenues declined as a consequence of the reduction in the inflation tax? (4) Finally, what was the growth rate of the stock of indexed assets and how much of the total of private savings was mobilized through those assets?

As to our first topic, three systems of forced savings were created under the new system. The first one, set up in 1965, was the National Housing Bank, which received all the revenues derived from the social security system, or FGTS (Fundo de Garantia por tempo de servicos). Workers and enterprises had to pay 8 percent of the wage bill to create an insurance fund against unemployment, corrected for inflation and paying a positive rate of interest. The total amount of the fund was transferred to the National Housing Bank, which financed housing construction.

The second one was the so-called Social Integration Program—PIS. Again a new fund was created, which got its resources from a tax proportional to enterprise sales and divided into quotas distributed to the workers. This fund is also corrected for inflation and pays a positive rate of interest. The funds were first given to the Federal Savings Bank (Caixa Econômica Federal), and more recently to the National Development Bank,

with the commitment to finance purchases of machinery and equipment on a medium- and long-term basis.

Finally, the third forced savings system, the Programa de Assistência aos Servidores Públicos, PASEP, is the complement of the former fund, extending the system to public workers. This fund, like the PIS, is managed directly by the Banco do Brasil, and is used, like the PIS, for medium- and long-term financing of machinery and equipment purchases.

All lending with these funds involves charges for inflationary correction in addition to a positive rate of interest in order to assure the "private" profitability of the fund. It has achieved very important results in financing the construction of popular housing, and a substantial part has been applied to the financing of private investments, either directly in the form of loans from CEF and BNDE to the firms, or through reallocation of the resources to private investment banks.

Table 11 shows the value of the stock of assets mobilized by these three funds, which had reached, by 1973, 18 percent of the total of indexed assets.

Next on our agenda are the activities of the National Monetary Council. Since the demand for investment goods that could be financed through the funds described above was not large enough at the prevailing price to utilize all the savings accumulated, the National Monetary Council started to sell indexed bonds to those agencies carrying a surplus, while giving the funds to other financial intermediaries that had deficits.

In fact, we see in Tables 12 and 13 that a substantial part of total ORTNs and LTNs sold by the Treasury was bought by BNH and CEF (approximately 33 percent of the total in 1973), indicating that those resources were channeled into the monetary budget and redistributed to the private sector through various credit lines for investment in agriculture, industry, et cetera.

The Central Bank opened a "window" operating as a development bank (to finance projects evaluated by the ministries of agriculture, industry and commerce, etc.), utilizing resources stemming partly from foreign loans (IBRD, IBD, etc.) and partly from surpluses of BNH and CEF. Special programs were created in agriculture, land redistribution, export promotion, etcetera, involving relatively large magnitudes, as can be seen from the data in Table 14.

Despite the fact that BNH and CEF had the presumed monopoly on using those resources, the National Monetary Council made their application more flexible, permitting their reallocation to areas demanding additional resources to finance investment projects.

On the other hand, as inflation was diminishing, interest had to be paid on compulsory reserve requirements of commercial banks. The profitability of these institutions, meanwhile, was declining for two reasons: first, the

TABLE 11 Growth of Some Selected Assets (millions of cruzeiros)

Year	Govern-ment Bonds[a] ORTN	LTN	Total[b]	Housing System H.B.	Private Financial System Term Deposits	Bills of Exchange	Total	Forced Savings FGTS	PIS	PASEP	Total	Grand Total
1964	29		29			245	245					274
1965	314		314			645	645					1009
1966	967		967	7	159	906	1,065					2,039
1967	1,052		1,052	140	555	2,105	2,660	597			597	4,449
1968	1,587		1,587	461	1,385	4,558	5,943	1,604			1,604	9,595
1969	2,225		2,225	922	2,831	6,172	9,003	2,803			2,803	14,983
1970	4,116	446	4,612	1,724	6,364	9,756	16,120	4,345			4,345	26,801
1971	4,742	1,247	5,989	2,762	13,080	14,390	27,470	6,332	297	729	7,358	43,561
1972	4,062	4,802	8,864	4,566	24,516	22,305	46,821	9,038	1,294	1,354	11,686	71,497
1973	3,724	6,140	9,864	6,259	40,521	37,129	77,650	12,907	3,459	4,100	20,466	114,239

SOURCE: Central Bank.
aNonbank holdings only.
bData from Tables 12 and 13.

TABLE 12 ORTN: Main Holders
(millions of cruzeiros)

Holders	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
A. Government	10 (0.024%)	87 (0.20%)	60 (0.04%)	485 (0.20%)	507 (0.15%)	1,150 (0.20%)	1,706 (0.18%)	2,175 (0.19%)	5,790 (0.36%)	6,871 (0.33%)
1. National Housing Bank	—	32	22	341	322	549	910	1,561	3,631	4,871
2. National Savings Bank (includes PIS)	—	—	10	28	7	390	506	338	1,841	1,950
3. Other public agencies	10	55	28	116	178	211	290	276	318	50
B. Monetary authorities	1 (0.02%)	6 (0.01%)	86 (0.06%)	132 (0.05%)	192 (0.05%)	519 (0.09%)	551 (0.06%)	715 (0.06%)	991 (0.06%)	1,462 (0.07%)
1. Bank of Brazil (includes PASEP)	1	6	13	30	40	341	528	661	508	1,257
2. Central Bank	—	—	73	102	152	178	23	54	83	205
C. Commercial banks (used as compulsory reserves)	—	13 (0.03%)	102 (0.07%)	391 (0.16%)	956 (0.27%)	1,587 (0.27%)	2,635 (0.28%)	3,548 (0.31%)	4,631 (0.29%)	8,107 (0.39%)
D. Public	30 (0.73%)	324 (0.75%)	1,153 (0.82%)	1,474 (0.59%)	1,836 (0.53%)	2,625 (0.45%)	4,520 (0.48%)	5,127 (0.44%)	4,563 (0.29%)	4,504 (0.22%)
1. Commercial and investment banks	1	9	186	422	249	370	404	385	501	780
2. Insurance companies	—	1	2	22	54	124	214	398	428	650
3. Others	29	314	965	1,030	1,533	2,131	3,902	4,344	3,634	3,074
E. Total	41	430	1,401	2,482	3,491	5,881	9,412	11,565	15,975	20,944

TABLE 13 LTN: Main Holders
(millions of cruzeiros)

Holders	1970	1971	1972	1973
1. Monetary authorities Central Bank	204 (0.29%)	1,810 (0.47%)	2,150 (0.21%)	5,906 (0.34%)
2. Government		140 (0.04%)	629 (0.06%)	973 (0.06%)
National and state savings banks	—	--	446	949
Federal development banks	—	140	183	24
3. Public	496 (0.71%)	1,930 (0.49%)	7,425 (0.73%)	10,521 (0.60%)
Commercial banks	—	683	2,623	4,381
Insurance	—	8	8	12
Others	496	1,239	4,794	6,128
Total	700	3,880	10,204	17,400

increase of time (indexed) deposits over total deposits, and, second, the decline in nominal interest rates for loans (in the face of a rise in real interest rates) due to the slower rate of inflation.

Since the required reserves were high (approximately 30 percent of total deposits) and could not be reduced immediately for fear of increasing the money supply further, the government decided to pay interest rates on a certain part of total compulsory reserves (this proportion increased continuously from 1965 to 1969, when it reached a level of 60 percent). The sales of indexed bonds to the private banking system had no impact whatever on the money supply; its sole effect was to increase the profit rates of commercial banks. Actually, this was simply an additional way for the government to return to society a part of the revenues accruing from the inflation tax.

In Tables 12 and 13 we estimate the amount of ORTNs and LTNs held by the public, deducting from the total the funds of government agencies and commercial banks held as an alternative for compulsory reserves. Adding the stock of housing bonds, time and savings deposits with inflationary correction, and bills of exchange, we arrive at an estimate of the total of financial assets held by the public.

The growth of these assets does not represent the effective increase in savings, at least not until 1969. We have already called attention to the existence of a parallel financial market before 1968 whose size it is impossible to estimate. This market was gradually reduced and, by 1969, was almost nonexistent. It is obvious that the transactions that had taken place before in the parallel market were absorbed by the official institutions.

TABLE 14 Sources and Uses of Banco Central Development Funds
(millions of cruzeiros)

Funds		—Foreign and Domestic Sources—				Uses			
		1969	1970	1971	1972	1969	1970	1971	1972
1. FUNAGRI	Agriculture and industry (general)	1,107.0	1,793.0	3,133.6	3,632.4	820.2	1,202.3	2,344.7	2,990.5
FNRR	Agricultural refinancing	597.3	951.9	1,654.7	1,877.4	448.1	677.8	1,224.6	1,585.8
FUNDECE	Capital opening incentive	125.4	147.1	166.5	187.2	123.7	139.8	156.1	178.0
FUNDEPE	Livestock development	32.5	50.8	172.3	459.1	10.0	43.6	155.3	409.4
FIBEP	Production goods import financing								
FUNDAG	Agricultural development (special)	209.9	203.9	156.2	84.3	135.5	142.9	133.4	68.2
OUTROS	Other nonclassified, including ICO	—	272.9	874.9	914.5	—	103.8	605.5	651.8
2. FUNINSO	Social investment	138.9	166.4	109.0	109.9	62.9	94.4	69.8	97.3
3. FINEX	Export financing	31.0	60.3	67.7	68.0	26.2	56.3	63.0	63.0
4. FUNFERTIL	Incentives for using fertilizers	44.2	96.5	107.3	531.5	23.8	73.1	76.9	512.6
		61.3	74.2	74.2	74.2	61.2	72.6	72.6	74.2

5.	PROTERRA	Redistribution of land and incentives of agro-industries in North and Northeast	—	—	—	720.9	—	—	—	282.8
6.	FERCAM	Exchange control stabilization	146.3	146.3	146.3	162.0	31.1	31.1	31.1	156.2
7.	PROGRAMA FIBEP	Program FIBEP—returns and "exchange correction"	35.4	87.7	136.0	202.2	10.4	50.1	80.2	106.0
8.	FDPAP	Agriculture and livestock products defense	7,420.8	9,651.7	14,105.214	408.8	4,588.4	5,690.9	9,081.7	9,241.7
			1,073.5	1,790.3	1,181.1	2,697.3	850.0	1,355.0	409.0	1,676.2
9.	IOF	Financial tax	—	—	291.0	379.6	—	—	3.9	135.3
10.	TRIGO CANADENSE	Canadian wheat								
11.	USAID	Two-step loans, principal and interest	176.1	176.6	176.6	176.6	27.8	66.7	108.5	175.1
12.	CCC	Commodity Credit Corporation—American wheat	201.1	222.2	386.3	398.2	102.5	145.9	305.6	350.0

At any rate, we are reasonably sure that any transactions still being made on the parallel market after 1970 were of a very small order of magnitude. Under these circumstances the data available permit us to estimate the flow of savings mobilized through the financial system.

Table 15 presents the results. The first column shows the flows obtained from Table 13 plus estimated increases in corporation capital. We calculate the ratio of total savings (estimated by this approach) to GNP, and compare this ratio to the share of gross private savings in GNP. We can see that these two proportions, from two independent sources, are not very different. Table 15 shows also that the introduction of inflationary correction permitted the creation of a financial system capable of mobilizing an important proportion of total private savings, thus helping economic development.

[V] RECENT EVOLUTION OF THE FOREIGN SECTOR AND THE MINIDEVALUATION

The great expansion in the external sector has been one of the factors most stressed in Brazil's recent economic growth. August 1968, the date on which the minidevaluation system was adopted, is considered the turning point in the process of opening the economy to international trade after

TABLE 15   Flow of Savings and Indexed Assets
(millions of cruzeiros)

Year	Indexed Assets[a] (1)	Shares and Debentures (2)	$\frac{(1) + (2)^a}{GNP}$ (3)	S/Y[a] (4)
1965	735			
1966	1.030	626		
1967	2.410	1.143		
1968	5.146	2.375		
1969	5.388	4.582		
1970	11.818	5.578		
1971	16.760	6.638	.09	.14
1972	28.376	12.503	.11	.13
1973	42.302	14.863	.12	.12
		ND		.14

SOURCE   Table 13

[From 1970 on National Accounts were revised by the Vargas Foundation data before and after 1970 are not comparable]

decades of following an import substitution strategy. Existing analysis of this problem tends to emphasize two points: (1) that, despite an effective opening of the economy, international trade does not seem to have played an important role as a source of growth compared to such other variables of the system as public investment; and (2) that the great success of the expansion in the foreign sector is due to the minidevaluation policy.

We believe that the explanation of the recent developments must take into account a greater number of variables than these. On the one hand, the expansion of foreign trade must have had a much larger impact than usually admitted. On the other, a more flexible commercial policy was adopted, which started reducing the average level of tariffs and introduced a system of export incentives. The minidevaluation policy greatly reduced the risk associated with export activities under the abrupt exchange rate fluctuations caused in the past by infrequent devaluations within a framework of massive inflation.

It is extremely important to point out that the minidevaluation system did not result in a fall of the real exchange rate over time. On the contrary, as will be shown later, the exchange rate appreciated during this period. This apparent paradox—an appreciation of the exchange rate side by side with a great expansion of exports—is reconciled when one notes that the country's terms of trade improved sharply. The gain in the relative price of exports was due to the joint effects of the export promotion system and the strong demand for our products in the world markets. These more than offset the effect of the exchange rate appreciation.[32] Finally, considering that the cruzeiro followed, along broad lines, the fluctuation of the dollar vis-à-vis the currencies of continental Europe, it was much easier to expand trade with the EEC.

On the other hand, given the behavior of the exchange rate, the interest rates on foreign loans of short and medium maturity (particularly those from the Eurodollar market) were lower than the domestic rates. This had several implications. First, the inflow of capital financed an increasing trade gap, with a positive impact on the economy's saving rate. Second, this had the effect of reinforcing a policy of reducing internal interest rates. Finally, it was possible to accumulate a higher level of reserves, an important fact given the increasing volume of Brazil's international transactions.

The system is open to some criticisms. There were some allocative costs inherent in the export promotion system actually chosen; the apparatus of import control, inherited from the period of import substitution, was still in operation; and the sharp increase in net foreign capital inflow required a much more careful external debt policy.

Nevertheless, the new system appears to be clearly superior to the one in force up to 1968, when the possibilities of new import-substituting projects

were drying up. Although the old system is well known, it is worthwhile to summarize its results.

1. Prior to 1968, the exchange rate was fixed in nominal terms. With a high level of tariffs, due to the import substitution strategy, the exchange rate was overvalued. Overvaluation and high tariffs resulted in a low level of import demand and penalized exports, resulting in a relatively low level of foreign trade. The main consequence was a slowdown in the growth process once the easier investment opportunities in the import-substituting sectors were realized.

2. Fixed nominal exchange rates under conditions of domestic inflation resulted in a high variance in the real exchange rate (deflated by the internal price index). Even if the average real exchange rate could have made some export activities profitable, the variance of prices introduced a high degree of risk that prevented the production for export of various potentially exportable products.

3. The expectation of devaluation resulted in an irregular behavior of foreign loans, with alternating inflows and outflows of hot money. As soon as a devaluation occurred there was a general expectation that the exchange rate would remain frozen for a relatively long period of time, since it was known that the exchange rate was changed infrequently. Consequently, whoever borrowed dollars and exchanged them for cruzeiros only had to pay the external interest rate, provided the exchange rate was not changed. The external interest rate was, under the inflationary conditions, lower than the domestic rate. When the balance of payments gap widened due to the rise in the internal price level, the expectation arose that the actual exchange rate could no longer be maintained. The result was that loans were liquidated whenever a devaluation was expected, with the consequent loss of reserves and reduction in money supply. Just after a devaluation, on the other hand, there was an inflow of hot money, expanding the monetary base and increasing the money supply.

The reduction of these undesirable effects was one of the main achievements of the minidevaluation policy. Thus, minidevaluations were important in the movement toward opening the economy as well as smoothing the operation of monetary policy.

Table 16 illustrates the behavior of the balance of payments for the period 1960–1973. One can clearly observe that from 1968 on exports began to grow sharply. However, since the growth of imports of goods and services was still higher, a deficit ensued on current account. The balance of payments showed a surplus nevertheless because, simultaneously, there was also a big increase in net capital inflows.

Table 17 presents some indicators that show the resultant increase in foreign trade. The share of exports (minus coffee) in GNP, around 3 percent at the beginning of the period, reached more than 5 percent (column 3) at

TABLE 16 Brazil's Balance of Payments, 1960–1973
(millions of U.S. dollars)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Exports and imports of merchandise														
Total	−23	113	−89	112	344	655	438	213	26	318	232	−341	−244	7
Exports FOB	1,270	1,405	1,215	1,406	1,430	1,596	1,741	1,654	1,881	2,311	2,739	2,904	3,991	6,199
Imports FOB	−1,293	−1,292	−1,304	−1,294	−1,806	−941	−1,303	−1,441	−1,855	−1,993	−2,507	−3,245	−4,235	−6,192
Services	−459	−350	−339	−269	−259	−362	−463	−527	−556	−630	−815	−980	−1,250	−1,664
Net transfers	4	15	39	43	55	75	79	77	22	31	21	14	5	27
Current account	−478	−222	−389	−114	140	368	54	−237	−508	−281	−562	−1,307	−1,489	−1,630
Net capital movements	58	288	181	−54	82	−6	124	27	541	850	1,015	1,846	3,492	3,687
Errors and omissions	10	49	−138	−76	−218	−31	−25	−35	−1	−20	92	9	436	121
Surplus (+) or deficit (−)	−410	115	−346	244	4	331	153	245	32	549	545	530	2,439	2,179

SOURCE: *Conjuntura Econômica*, vol. 29, no. 1, January 1975.

TABLE 17 Brazil: International Trade

Year	Exports (FOB)[a] (except coffee) (1)	GNP[a] (2)	Exports/ GNP (3)	(Exports + Imports) / GNP (4)	(Exports + Imports)[b] / GNP (5)
1960	88	2,734	3.22	6.36	4.8 (2)
1961	166	4,029	4.12	6.75	4.8
1962	206	5,339	3.86	7.67	5.8
1963	363	11,857	3.06	5.61	5.0
1964	773	22,904	3.37	8.19	6.3
1965	1,614	36,424	4.43	5.69	4.6
1966	2,133	53,216	4.01	6.65	6.4
1967	2,474	70,699	3.50	6.05	6.2
1968	3,629	98,957	3.67	6.57	6.6
1969	5,989	131,883	4.54	6.90	6.9
1970	8,234	204,723	4.02	5.80	6.2
1971	11,272	271,809	4.15	6.36	7.1
1972	17,746	355,822	4.99	7.26	8.5
1973	30,179	473,181	6.38	8.02	10.4

SOURCE: International Financial Statistics and APEC, 1974.
[a]Millions of cruzeiros.
[b]Exports and imports evaluated at 1968 exchange rate.

the end. Using the expression $\dfrac{(X + M)/2}{GNP}$ as an indicator of the size of foreign trade, one can see that this ratio went from 6 percent to 8 percent of GNP. Furthermore, since the value of exports is calculated by multiplying the external price by the exchange rate, the size of trade is reduced when the exchange rate appreciates, everything else remaining constant.[33] To allow for this effect we reconstructed (in column 5) the relative volume of trade, using the exchange rate of 1968; its share of GNP doubled during the period under review, showing that international trade was a much more important source of growth than some people indicate.

We cannot forget, either, that this behavior occurred at a time when domestic output was growing at a fast rate; that better terms of trade means a higher real income for the country;[34] and that the trade gap increased the overall savings rate.

After a general review of the foreign sector we shall comment in more detail on the variables responsible for this success. Given the present interest in the aspects of the foreign sector connected with indexation, it is valid to begin the analysis with the effects of the minidevaluation policy.

It was previously pointed out that the change in the mechanism of exchange rate devaluation did not result in a relative fall in the value of the cruzeiro and that the principal advantage of the minidevaluations was to

reduce the risk associated with export activities. Figure 3 emphatically illustrates that with the new policy the real exchange rate no longer fluctuates as much as before.

As a measure of the fluctuations in the real exchange rate we used its moving four-quarter standard deviation.[35] Note that before 1968 the variance of the real exchange rate had already diminished as a result of the lower inflation rates registered. However, in the fourth quarter of 1968 a sharp reduction in the fluctuations of this real rate occurred, without a notable reduction in the level of the inflation rate. Thus, it seems justifiable to consider 1968 as the turning point of the trend in export receipts.

Tables 18 and 19 show data that support the argument presented in the first part of this analysis concerning the performance of foreign trade. First we look at the evolution of the official real exchange rate and of the effective rates for exports and imports (Table 18).

The empirical treatment adopted is outlined below. The official exchange rate (column 1) was deflated by the internal price index (Index 2 of *Conjuntura Econômica*). Up to 1970 for exports and 1969 for imports, the figures for effective exchange rates were taken from Bergsman's work; the others are our estimates. As far as exports are concerned, the methodology used was identical, so that the series are perfectly comparable.[36] On the import side, there is a small difference between Bergsman's figures and our estimates. This is so because it was impossible to include in the estimates for nominal protection the net effect of the so-called "Regimes Especiais de Importação" (special import systems), particularly "Preços de Referência" and "Contingênciamento."[37] This omission, however, turned out to be quantitatively unimportant, for it was possible to estimate nominal tariffs with and without "Regimes Especiais de Importação" for 1971, and the resulting effective exchange rates differed by only 5 percent. Since the number of products included under that system does not seem to have increased substantially (at least not until 1973), we believe our estimates can be utilized without incurring large mistakes. It should be recalled, however, that the primary concern is with evolution of the series rather than its absolute values. One must also point out that it was not possible to estimate the effective 1974 exchange rate for exports and the 1973 rate for imports.

Returning to Table 18, one can see that the minidevaluation system did not result in a faster devaluation of the cruzeiro; on the contrary, between 1968 and 1973 the real exchange rate appreciated at an annual compounded rate of 5.4 percent. On the other hand, the export promotion system smoothed this tendency without avoiding appreciation. As a matter of fact, the effective exchange rate for exports appreciated over the same period at an annual compounded rate of 3.2 percent. The exchange rate for imports appreciated at a rate of 1.8 percent between 1968 and 1974, due
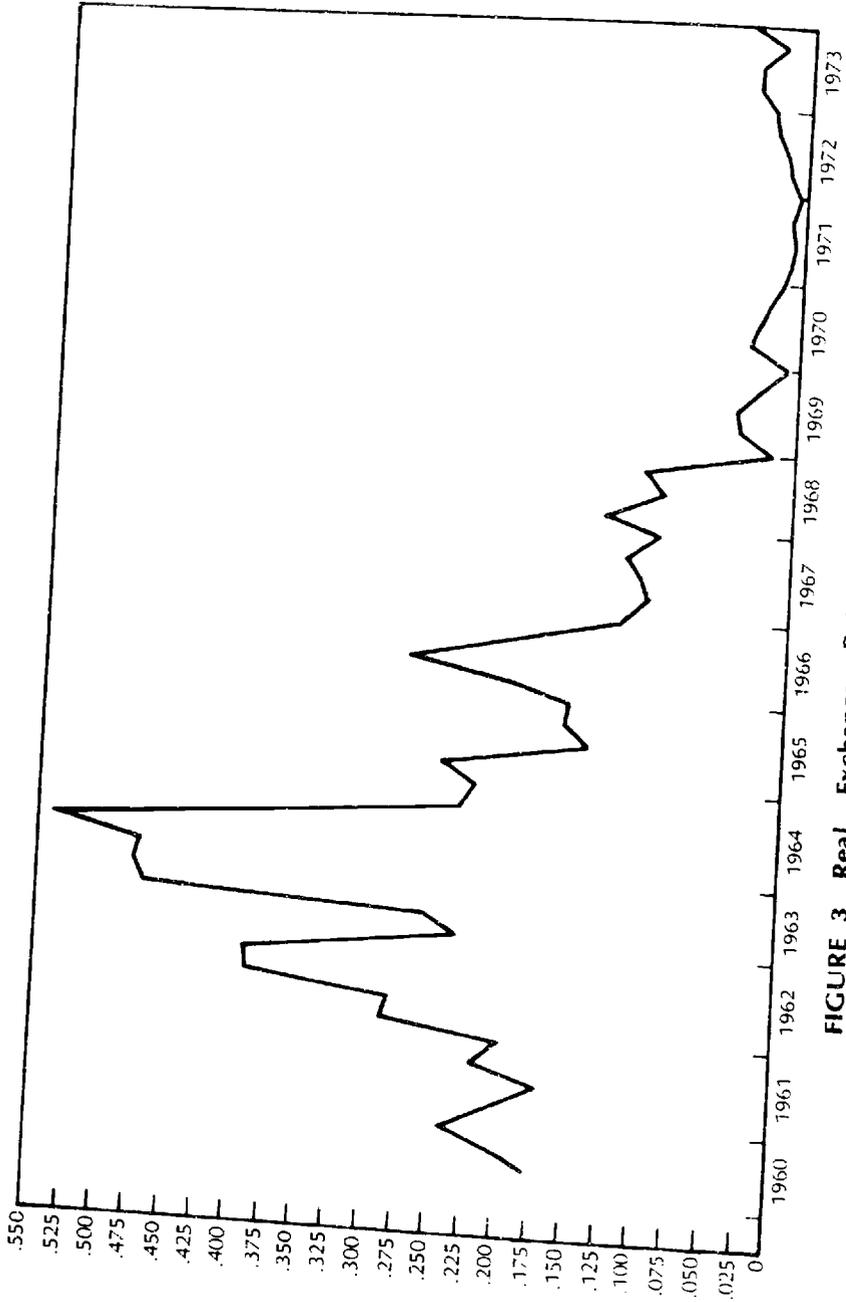
FIGURE 3 Real Exchange Rates—Standard Deviation
(1960–1973)

TABLE 18   Official Real Exchange Rate and Effective Exchange Rates for Imports and Exports

Year	Official Exchange Rate[a] (1)	Effective Rate for Exports (2)	Effective Rate for Imports (3)	Effective Rate, M / Effective Rate, X (4)
1960	2.8554	2.4096	4.7289	.96
1961	2.9923	2.6923	6.4176	1.38
1962	2.8094	2.6812	7.1812	1.68
1963	2.3842	2.2851	6.5331	1.86
1964	2.7572	2.6247	6.2104	1.37
1965	2.6160	2.5920	5.2268	1.02
1966	2.2229	2.2066	3.6299	.65
1967	2.0798	2.0445	2.9047	.42
1968	2.1344	2.1195	2.8742	.36
1969	2.1204	2.2135	3.0729	.39
1970	1.9952	2.0913	3.1909	.53
1971	1.9086	2.1428	3.0524	.42
1972	1.8314	2.0090	2.7559	.37
1973	1.6423	1.8072		
1974	1.4183(4)		2.5751	

SOURCE: Central Bank, *Conjuntura Econômica.*
[a]Deflator: Index 2 from *Conjuntura Econômica*, FGV; 1965–1967 = 100.

not only to the appreciation in the exchange rate but to some tariff reductions as well.[38]

   Table 19 shows the evolution of the terms of trade and of the price index of exports and imports in U.S. dollars. In can be seen that there was a considerable gain in the terms of trade between 1968 and 1973.[39] The real remuneration of exports increased over time at an annual rate of 8.1 percent. By the same token, the cost of imports increased at an annual rate of 1.7 percent between 1968 and 1972, due to the upward tendency of dollar prices of imports.

   In short, it is possible to explain the movement of export receipts via the joint effect of the minidevaluations, the export promotion system, and the gains in the terms of trade, which combined to raise export revenues despite the persistent appreciation in the real exchange rate. The latter development, discussed below, was consistent with the increase in the inflow of foreign capital.

   It was already pointed out that the balance of payments surpluses and the resulting accumulation of reserves were the result of a strong net inflow of foreign capital from 1968 on. The capital inflow permitted an increase in the trade gap, and thus in the total savings rate as well as in the capacity to grow in the short and medium term.

   A more detailed analysis shows that net capital inflow was due mainly to

TABLE 19 Terms of Trade and Export and Import Prices

TABLE 19 Terms of Trade and Export and Import Prices (1965–1967 = 100)

Year	Terms of Trade (1)	Export Prices (2)	Import Prices (3)
1960	98.4	93.3	94.8
1961	102.0	98.0	96.4
1962	88.0	85.5	97.2
1963	85.6	85.2	99.5
1964	106.0	102.0	96.4
1965	107.0	103.0	97.7
1966	98.9	98.7	99.8
1967	96.6	98.5	102.0
1968	92.6	97.2	105.0
1969	97.6	100.0	103.0
1970	108.0	113.0	105.0
1971	100.0	109.0	109.0
1972	106.0	123.0	117.0
1973	116.0	169.0	141.6

SOURCE: Central Bank, *Bulletin*, January 1975.

a sharp increase in foreign loans, especially those contracted in the Euromoney markets.[40] This inflow was caused, on the supply side, by the well-known expansion in the Eurodollar markets, and on the demand side, by two aspects of the indexing policy. It was stressed before that inflationary correction was practiced widely, particularly with relation to credit instruments; consequently, interest rates became generally positive, ranging from 4 to 10 percent, depending upon the source of credit. With the opening of the economy local entrepreneurs had two choices: either to borrow in the domestic market, paying interest and inflationary correction, or in the Euromoney market, paying interest plus a risk premium plus exchange rate devaluations. Of course, if external borrowing is at any given time cheaper than a domestic source the former will be chosen (provided there are no restrictions from the supply side at prevailing interest rates). In fact, given the actual devaluation rate, external borrowing was found to be the cheapest alternative.

Table 20 indicates interest rate differentials. We compare the indexes of inflationary correction from ORTN[41] with the sum of the exchange rate devaluation plus Euromoney quarterly interest rates. The risk premium paid in loans to Brazil is left out due to lack of detailed information (we know that this premium had a value between 1.5 and 2 percent up to 1972, fell to 0.75 percent in 1973, and rose again to 1.75 percent in 1974). We can see that, even allowing for a risk premium of 2 percent, any Brazilian credit source operating with inflationary correction plus interest of 5 percent or more would be more expensive than the alternative of external borrowing

TABLE 20 Interest Rate Differentials

Year	Quarter	Inflationary Correction Rate[a] (1)	Exchange Rate Devaluation[b] (2)	U.S. Interest Rate[c] (3)	Eurodollar Interest Rate[d] (4)	U.S. Interest Rate Differential[e] (5)	Eurodollar Interest Rate Differential[f] (6)	Net Short-Term Capital Inflow[g] (7)	International Reserves Flow[h] (8)
1965	III	53.70	13.90	4.19		35.61			+ 55
	IV	60.80	32.56	4.53		23.71			+ 55
1966	I	50.26	19.91	4.97		25.38			− 38
	II	36.72	20.26	4.94		11.52			− 25
	III	32.99	20.07	5.54		7.38			+ 5
	IV	37.81	− 0.01	5.35		32.46			+ 5
1967	I	39.93	22.41	4.64		12.88			− 29
	II	36.68	22.30	9.57		9.81			− 123
	III	30.92	22.44	5.25		3.23			− 42
	IV	24.73	22.56	5.66		− 3.49			− 32
1968	I	21.84	18.17	5.67		− 2.00			+ 112
	II	21.69	18.76	5.94		− 3.01			− 100
	III	22.46	34.84	5.54		− 17.92			+ 40
	IV	24.49	40.42	5.83		− 21.76			+ 6
1969	I	25.29	23.49	6.34		− 4.54			+ 39
	II	24.61	25.67	6.50		− 7.56			+ 80
	III	19.87	13.23	7.47		− 0.83			+ 129
	IV	18.11	13.02	7.79		− 2.70			+ 151
1970	I	19.30	11.43	7.76	9.42	0.11	− 1.55	242	+ 195
	II	18.73	12.67	7.75	8.87	− 1.69	− 2.81	113	+ 100
	III	18.69	12.81	7.45	8.30	− 1.57	− 2.42	169	− 17
	IV	19.46	13.12	6.32	7.47	− 0.02	− 1.13	156	+ 85

TABLE 20 (Continued)

Year	Quarter	Inflationary Correction Rate[a] (1)	Exchange Rate Devaluation[b] (2)	U.S. Interest Rate[c] (3)	Eurodollar Interest Rate[d] (4)	U.S. Interest Rate Differential[e] (5)	Eurodollar Interest Rate Differential[f] (6)	Net Short-Term Capital Inflow[g] (7)	International Reserves Flow[h] (8)
1971	I	18.70	14.69	5.05	5.54	− 1.04	−1.53	170	+ 84
	II	18.23	15.25	−5.74	6.73	− 2.76	−3.75	366	+ 117
	III	20.57	16.90	6.19	7.71	− 2.52	−4.04	251	+ 145
	IV	23.01	15.61	5.27	6.34	2.13	1.06	291	+ 142
1972	I	21.28	14.94	5.21	5.27	1.13	1.07	414	+ 280
	II	21.46	12.56	5.57	5.14	3.33	3.76	575	+ 409
	III	20.25	10.06	5.77	5.50	4.42	4.69	699	+ 862
	IV	16.44	9.88	5.87	5.94	0.69	0.62	647	+ 835
1973	I	14.93	3.68	6.49	7.37	4.76	3.88	553	+ 737
	II	14.40	3.13	6.85	8.47	4.42	2.80	657	+1,060
	III	12.85	2.08	7.52	10.99	3.25	−0.22	552	+ 443
	IV	12.81	0.05	6.82	10.13	5.94	2.73	559	− 45
1974	I	13.97	7.05	6.91	9.03	0.01	−2.11	325	+ 119
	II	15.11	9.67	8.07	11.44	−- 2.63	−6.00	1,423	− 20
	III	22.82	15.11	8.45	12.09	− 0.74	4.38		
	IV	32.31							

It is not surprising that from 1969 on there was a net inflow of short-term capital and an accumulation of reserves. Also, the minidevaluation policy, by reducing the exchange rate risk substantially, increased the attractiveness of external financing.

On the other hand, and without supply restrictions, a persistent appreciation of the cruzeiro would bring such an inflow of capital that no reasonable limits to external debt and monetary expansion could be maintained. This is what happened in 1973, when the government was forced to raise the cost of borrowing through the imposition of controls (such as keeping part of the loan deposited with the monetary authorities, maturities for new loans of more than five years, etc.).

In short, we found the foreign economic policy to follow a consistent, although not necessarily the most economical, path. As long as the terms of trade did not turn against the country, export income could rise despite the appreciation of the exchange rate. This, in turn, induced an interest differential which increased the net inflow of foreign resources, making it possible to finance a wide trade gap and reinforce the national savings rate. It is believed, however, that given the conditions prevailing in 1974 (a strong deterioration in the terms of trade and a higher growth rate of income at home than abroad), this policy was no longer followed consistently, mainly because export income needed to be reduced.

Finally, it must be said that the system described above has involved some costs. It is accepted in the literature that devaluation is superior to an export pro. lotion system that discriminates among various sectors.[42] On the other hand, administration of the external debt becomes more complex in a system such as the one described. Altogether, however, it seems reasonable to conclude that the opening of the economy was indeed a key factor in Brazil's economic boom between 1968 and 1973.

NOTES

1. Although the expression "monetary correction" has been generally used, we feel that it would fit in more with the concept involved here to use the expression "inflationary correction."
2. Previous work by Delfim Netto et al. ("Alguns Aspectos da Inflação Brasileira," ANPES, 1965) shows that the subsidies to cover deficits of the national railroad system and the state's shipping companies alone reached 60 percent of the Treasury's cash deficit in the late fifties and early sixties.
3. See, in this connection. J. Bergsman ("Brazil: Industrialization and Trade Policies," Oxford University Press for OECD. 1971).
4. This point is carefully made in M. H. Simonsen, J. M. Chacel, and Wald ("Correção Monetária." Rio de Janeiro, APEC 1972).
5. See, for instance, J. Guenther ("Monetary Correction in Brazil," (paper presented at Seminar on Indexation, São Paulo, 1974)).
6. Several authors used this argument. Simonsen ("Inflação; Gradualismo ou Tratamento

de Choque?" Rio de Janiero, APEC 1972) states that after the introduction of the inflationary correction inflation itself would be almost independent of the rate of monetary expression, the feedback mechanisms (inflationary correction) being its main determinant in recent years. A. Fishlow accepts this idea ("Monetary Correction: Inflation without Tears?," paper presented at Seminar on Indexation, São Paulo, 1974), and it is utilized in an argument against the mechanism of inflationary correction.

7. In another work A. C. Pastore and R. D. Almonacid ("Gradualismo ou Tratamento de Choque," *Pesquisa e Planejamento Econômico*, December 1975) show that the expected rate of inflation tends to be the dominant factor in the short run, but that the money supply is more important in the long run. If indexing allows a faster feedback mechanism, in the sense of increasing the awareness of the cost of holding money, it can be a destabilizing factor.

8. See, for instance, S. A. Morley (Indexação e Combate à Inflação," *Estudos Econômicos*, March 1976).

9. The implications of this argument are analyzed in greater detail by Fendt (See p. 93 below).

10. This point is elaborated in Pastore and Almonacid (1975).

11. Here we are including neither a discussion of the wage problem, partially analyzed by R. Macedo (*Estudos Econômicos*, vol. 6, no. 1, 1976), nor the problem of stability.

12. See Simonsen, Chacel, and Wald (1972), Guenther (1974), and Fishlow (1973).

13. The revenues of the federal government as a proportion of GNP remained at a very low level. See the analysis of Delfim Netto et al. (1965).

14. This is an application of the "principle of effective market classification" as defined by Mundell. Clearly the allocation of fiscal policy to increase government savings and of monetary policy to stabilize the price level is valid in a closed economy. Due to the lack of substantial capital movements in Brazil at that period and to the nature of international trade restrictions, this is a valid ex-post proposition in the case under consideration.

15. The empirical analyses made by A. Harberger ("The Dynamics of Inflation in Chile," in C. Christ, ed., *Measurements in Economics*, Stanford, 1963) for Chile, A. C. Diz ("Money and Prices in Argentina, 1935–1962," in D. Meiselman, ed., *Varieties in Monetary Experience*. 1970) for Argentina, Pastore ("Notes on the Recent Monetary Policy in Brazil," *Annais of Economic and Social Measurement*, 4:4, 1975) for Brazil, and more recently by R. Vogel (*American Economic Review*, March 1974) for a series of Latin American countries show that the rate of inflation takes a fairly long period of time (one year or more) to adjust to changes in the money supply.

16. See P. Cagan ("The Monetary Dynamics of Hyperinflation," in M. Friedman, ed., *Studies in the Quantity Theory of Money*, Chicago, 1956) for the case of seven hyperinflations, J. Deaver ("The Chilean Inflation and the Demand for Money," in D. Meiselman, op. cit.) for Chile, Diz (1970) for Argentina, and Pastore (1975) for Brazil.

17. We are obviously concentrating only on the resources derived from the inflation tax, leaving aside the discussion related to the welfare costs of inflation finance.

18. See Pastore and Almonacid (1975).

19. See Almonacid ("Rumo à Teoria da Dinâmica Econômica," dissertation. University of São Paulo, 1974), pp. 46–48, and Pastore (1975), pp. 490–491.

20. For the model's internal consistency, Pastore and Almonacid (1975) showed that we need to distinguish between the expected rate of inflation and the rate of change in the expected price level; once in full equilibrium we must have both $\pi = \pi^\cdot$ and $p = p^\cdot$. This last equality does not hold even in full equilibrium when we use only Cagan's expectation equation, but for reasons of simplicity we ignore this point here.

21. The stability conditions of the model are analyzed in Pastore and Almonacid (1975), Appendix A.

22. This implies that in a distributed lag model in which the price level is expressed as a function of the present and past values of $\dot{M}$ we must have negative weights after a certain lag. For supporting evidence see Diz (1970) for Argentina and Pastore (1975) for Brazil.

23. See Pastore (1975).

24. Ibid.

25. As the income elasticity of the demand for money is positive, and some of the revenues depend on y, the full equilibrium inflation revenue will be underestimated if income is growing. M. Friedman ("Government Revenue from Inflation," *Journal of Political Economy*, 1972) called attention to this point.

26. We are ignoring the social costs involved in controlling the payment of interests on deposits. This induces banks to pay implicit interest in the form of services, which is the utilization of real resources. This point is pursued in Fendt in this volume.

27. A good description of the main tax reform in Brazil is given in Simonsen's paper at this seminar.

28. A better explanation of the institutional reforms in Brazil is given in Pastore (1973).

29. See Pastore (*Pesquisa e Planejamento Econômico*, December 1973).

30. The data after 1970 are from the revised National Accounts published by the Vargas Foundation.

31. Clearly, the rise in the inflation rate in the rest of the world ought to increase the nominal interest rate there and wash out this difference. It happened that this rate did not adjust fully to inflation, thus subsidizing Brazil. On the other hand, the way in which exchange rate expectations are formed in Brazil is also a controversial issue. Between 1968 and 1973 the current accounts deficit in the balance of payments remained more or less under control (the Central Bank has calculated that a trade gap of 1 billion dollars a year would reduce the service-debt ratio over time). With a growing trade gap (like the one in 1974, which reached 5 billion dollars), people can expect a sharper devaluation, reducing their incentive to borrow abroad in order to avoid a massive capital loss.

32. We also must consider the reduction of risk, already noted, derived from the minidevaluation policy.

33. GNP is evaluated on the basis of internal prices.

34. We also have to consider the technological improvement due to the inflow of capital goods and the additional demand for lagged sectors, such as textiles, shoes, and agricultural products.

35. We estimated moving standard deviations for each set of four quarters from 1960 on.

36. The export incentives here considered are essentially those included in the federal (IPI) and state (ICM) value added tax.

37. The "preço de referência" is an antidumping device, where the tariff is paid over a price imposed by the Tariff Council, independent of the actual import CIF price. The "regime de contingênciamento" obliges local enterprises to buy some quantity of a locally produced product in order to be able to import the very same product at a preferential tariff.

38. In 1974 tariffs rose again. The average nominal tariff was 59.9% in 1971, 50.5% in 1972, and 81.6% in 1974.

39. Although data from 1974 are unknown, the terms of trade turned against the country mainly due to the rise in petroleum prices.

40. For more details, see *Conjuntura Econômica*, January 1975.

41. Those are the indexes utilized to correct the value of most bonds.

42. The Brazilian export promotion system is, to a large extent, the mirror image of the import substitution system. See, for example, Mendonca de Barros et al. (1973) and Savasini et al. (1974).