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PUBLIC SAVINGS, PRIVATE INVESTMENT AND
GROWTH RESUMPTION
IN BRAZIL

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Abstract

The paper examines the medium to long run consequences of different types of fiscal policy in an unfavourable environment concerning expectations. The importance of both public investment and public financing of private investment in the past growth experience in Brazil is analysed and it is argued that they are bound to remain important in a future growth project. With the help of a simulation model, presented in the appendix, some growth policy options for the nineties are evaluated. It concludes that, in order to restore reasonably high GDP growth rates, a strong fiscal adjustment -- mainly designed to increase domestic savings -- will be required. Furthermore, it is shown that the pattern of the required fiscal adjustment depends on the degree of complementarity between public and private investments. For a given increase in the fiscal effort, the higher the complementarity, the lower should be the public financing of private investment (or the absolute value of the negative PSBR). It is also shown that the lower the complementarity the higher should be the importance of public investment.

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Resumo

Este trabalho examina consequências de médio e longo prazo de diferentes tipos de política fiscal em um contexto desfavorável de expectativas depois do fracasso de vários programas de estabilização. Argumenta-se que um projeto de crescimento para a economia brasileira dificilmente poderá prescindir do papel do investimento público nem de um papel complementar para a poupança pública, daí a importância de um ajuste fiscal como forma de alargar as opções de crescimento para a economia brasileira nos anos noventa. Mostra-se, com o uso de um modelo de simulação, que o padrão de ajuste depende do grau de complementaridade entre investimento público e privado. Em particular, para um dado esforço fiscal, quanto mais complementar for o investimento público menor deve ser o financiamento público (ou o valor absoluto de uma NFSP negativa), e menor a importância do investimento público no total.

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0. Introduction¹

Almost every analyst of the Brazilian economy in the beginning of the nineties seem to agree that fiscal adjustment is an essential element of a policy aimed at controlling inflation and resuming economic growth. This apparent unanimity, however, does not go very far, since each will tell her own story about the reasons and nature of a fiscal adjustment. This paper tells a story about the role of different kinds of fiscal policy variables in both warranting public sector consistency with growth equilibrium and enhancing the country's domestic saving in order to sustain economic growth.

The public sector considered in the paper has two main characteristics: it invests directly and supplements private sector's savings through official credit agencies which exist mainly because there are no developed long term capital markets. These two features have important consequences to the role of growth-oriented fiscal adjustment in the context of a serious and long-term minded stabilization policy.

¹ The authors wish to thank, without incriminating, Lance Taylor for overall inspiration and discussions of ideas leading to this paper, and to Mariana de Moraes Bastos for competent research assistance.

Besides, after a long period of failure in controlling the rate of inflation, the government faces difficulties in stimulating growth through usual expansionist policies because higher deficits and lower unused capacity may be read by private agents as a signal that the economy is once again on a hyperinflation track.

The paper thus explores the medium to long run consequences of different types of fiscal policy in an unfavourable environment concerning expectations. It contains five sections, besides this introduction. The next one summarizes the importance of both public investment and public financing of private investment in the past growth experience in Brazil. It is argued that they are bound to remain important in a future growth project. Section 2, discusses the basic features of a simulation model, presented in the appendix which is used for the analysis of growth policy during the next decade. The simulations performed with the model, in section 3, lead to the conclusion that, in order to restore reasonably high GDP growth rates, a strong fiscal adjustment -- mainly designed to increase domestic savings -- will be required. In section 4, it is shown that the pattern of the required fiscal adjustment -- which involves both an increase in the fiscal effort and a level for the PSBR -- depends on the degree of complementarity between public and private investments. For a given increase in the fiscal effort, the higher the complementarity, the

lower should be the public financing of private investment (or the absolute value of the negative PSBR). It is also shown that the lower the complementarity the higher should be the importance of public investment. Section 5 presents some final comments.

1. Public Investment and the Financing of Private Investment

The resumption of reasonably high and stable growth rates in Brazil is bound to require much more than successful stabilization policies, no matter how difficult that has proved to be so far. It will certainly require a significant increase in the aggregate-investment/GDP ratio, which has reached quite low levels in the late eighties and adequate financing for faster capital accumulation. This raises important policy issues which are not receiving proper attention and deserve a serious research effort. Some of these issues are considered below.

To make a rapid growth project feasible in most Latin American countries there must be a decision -- either implicit or explicit --, on the part of their societies, to postpone present consumption. The needed consumption restraint does not necessarily demand an absolute cutback either in the level of aggregate consumption or, given the demographic dynamics, in consumption per capita. What it demands is a fall in the share of consumption in GDP, that in many cases may be rapidly attained if consumption growth falls significantly behind GDP growth for some time. Such restraint may be perfectly consistent with a relatively fast increase in the living standards of the poorest segments of

society, as long as there is an offsetting restraint effort in other segments.²

The crucial step to assure adequate financing to a rise in the economy's investment ratio is the complex bargaining on how exactly the aggregate consumption restraint will be accomplished and the required additional restraint effort will be allocated. Which part should fall on government consumption and which on private consumption? Distinct ways to induce private consumption restraint should be considered, taking into account the probable distributional impact of each alternative. The feasibility of rapid growth resumption will depend on how society and the body politic will perceive and deal with these questions.

There are many specific issues to be faced on that matter. What can be expected from private savings and what should be the role of publicly generated savings? The latter include not only traditional public-sector savings -- resulting from government current account surplus and public enterprises' retained profits -- but also private contributions to compulsory savings funds, which are merely

² According to recent income distribution data the share of the poorest 10 percent of the working population in Brazil is only one percent of total income. The share of the poorest 30 percent is only 6 percent. See Sedlacek and Barros [1989].

administered by government, but ultimately belong to individuals and private firms that have limited access to their respective shares. An increase in contributions to compulsory saving funds is more unlikely to end up partly financing government consumption than a tax raise. On the other hand, such contributions are often charged on wage earners and low income groups and raising them may therefore be debatable, compared to progressive taxation schemes.

Of course, a rise in public-sector savings requires a fiscal adjustment. However, that adjustment has not necessarily to follow from an increase in the net tax burden, arising from either higher taxes or lower subsidies and non-financial transfers. It may also follow from other measures as well: a cutback in government consumption, a rise in the productivity of public enterprises, an increase in the prices of goods and services sold by those enterprises, and a reduction in the interest payments on both domestic and external public debt. A close analysis of public sector accounts, as well as awareness of political constraints, is required to assess the most promising shape of a fiscal adjustment that could lead to a significant increase of public sector savings.³

³ The model presented in the next section uses a fiscal effort variable (z), which is defined as tax revenue, net of subsidies and transfers, plus public enterprises' operational surplus, less government consumption expenditures and interest payments on the public sector domestic debt. Public savings are defined as the difference between the fiscal effort variable (z) and interest payments (js) on the public-sector's

Some of the trade-offs which are involved in the design of a policy that could effectively generate the required enhancement of the domestic savings effort in Brazil are analyzed in Werneck [1987a], through simulations based on two simple consistency models. Those simulations outline what would be the required increase in the private sector's saving effort in different scenarios, that involve distinct sets of hypotheses on the evolution of income distribution and of variables that determine the public-sector's savings capacity. The results stress the lack of realism of savings policies that do not restore the importance of public sector savings, which used to represent - in the mid seventies - one third of total domestic savings in Brazil. The need to restore the importance of public sector savings becomes particularly clear when one considers scenarios involving even a modest -- and highly probable -- redistribution of income in favor of labor in the near future, and takes into account its consequent impact on the private savings ratio.

To say that a large part of the required increase in domestic savings will probably have to be generated by the

foreign debt. A fiscal adjustment that leads to an increase in public savings has to stem from these two variables. This treatment of the problem follows Carneiro and Werneck [1988].

public sector does not mean that there will be a corresponding rise in public investment. A large part of the additional publicly generated savings may end up financing an increase in private investment. Public financing of private investment has been a historical feature of the Brazilian growth experience. In principle, there is no reason to believe that the future growth experience will be very different in this respect. But the allocation of the increase in domestic savings between the financing of public and private investments is an issue which may be discussed separately from savings policy issues. That allocation will be determined by the relative importance of those two investment components in the future.

Age-old arguments concerning the engines of growth, the strategic role of infrastructure investment, or the role of the public investment in providing positive externalities to private investors do not seem to have been made obsolete by trendy pessimism concerning the reform of the public sector. There is hardly any convincing evidence that public investment has become less necessary than before in order to attract private capital and bind private interests to feasible national projects, as many have recently seemed to assume.

The public sector, at all levels -- specially the federal public enterprises, which are crucially important for

any serious effort at increasing public investment -- is overburdened by debt and unable to generate the required savings to finance either traditional or non-traditional public investment. Much less yet is available to supplement private savings through long term finance provided by the development banks' network.⁴ Apparently, however, there is no reason to forsake public investment simply because the public budget is overburdened with the unpaid costs of the past growth experience.

The model presented in the next section is a convenient analytical tool to assess the importance of public investment and to evaluate the relevance of the hard-to-estimate parameters describing investment complementarity and the sensitivity of private investment to capacity utilization. The issue of a sustainable level of capacity utilization is likely to rank high in the next years after the successive failures of the attempts at stopping inflation in the country.⁵

⁴ See Werneck [1986] and Werneck [1987b] for the analysis of the reasons behind the fall in public savings. Carneiro [1987] and Carneiro and Werneck [1986] examine the investment strategy and the subsequent decline in the investment ratio.

⁵ For an account of those failures see Modiano [1989].

2. Determinants of Growth Equilibrium: A Model

The simulation model used here is similar to that described in Carneiro and Werneck [1990]. It follows, with small adaptations, Taylor's [1988] proposal to serve as a common analytical framework for the recent WIDER country studies on medium term development. A complete description is given in the Appendix.

The choice of variables on which to concentrate, namely the average rate of capacity growth (g) and the level of capacity utilization (u), follows from a point developed in the previous section. In view of the present financial crisis of the public sector, after a long experience of inflation and high uncertainty, the Brazilian government faces a dilemma when it tries to stimulate private investment: if it keeps the economy operating at a low level of capacity utilization, it may depress private investment on grounds of future anticipations of low demand; if it keeps the economy at high level of utilization it may be signalling high inflation and accompanying higher policy-uncertainty.

Thus, the basic equation says that the determinants of private investment are (expected, equal to realized) output, and public investment. Expressing all variables of the model

as proportion of potential GDP, and assuming linearity one may write:

$$ip = io + (\alpha).ie + (\beta).u$$

[I]

where (ip) is private investment, (ie) public investment, (u) the rate of capacity utilization and (io) a constant term.

Average growth of productive capacity during a period - say, a decade - is determined by total investment and its productivity. Total investment is of course private (ip) plus public (ie) investment. Domestic savings are private savings (sp), determined by the private sector's disposable income, plus public savings (sg), determined by the level of fiscal effort, as defined in the previous section, and the interest payments on foreign debt.

Figure 2.1 presents two loci of pairs (g,u). The rising locus (gs) represent pairs which are consistent with equilibrium between saving and investment, i.e.:

$$ip + ie = s = sp + sg + (\phi)$$

[II]

where (ϕ) stands for the current account deficit of the balance of payments, all variables expressed as fractions of potential GDP.

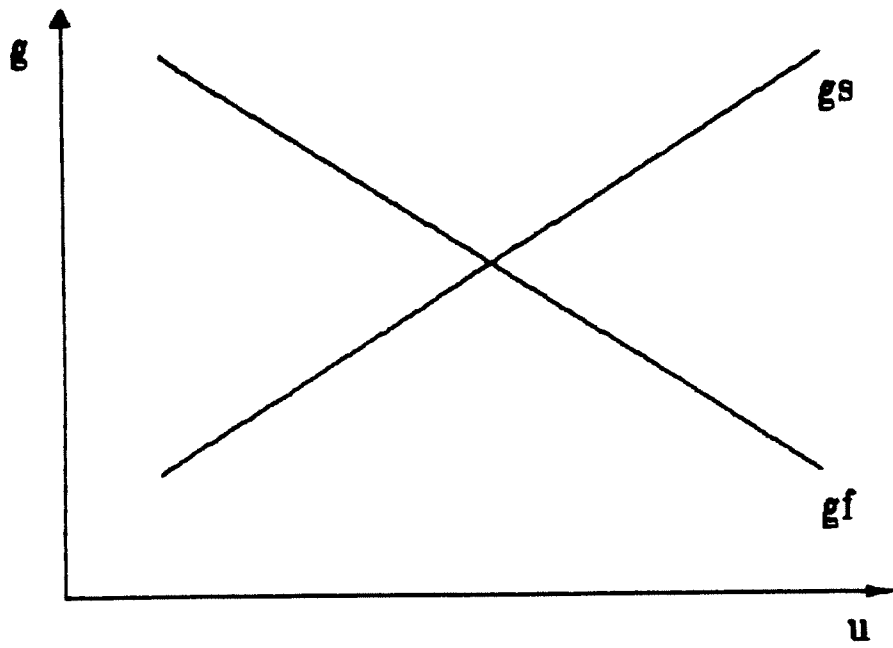


figure 2.1

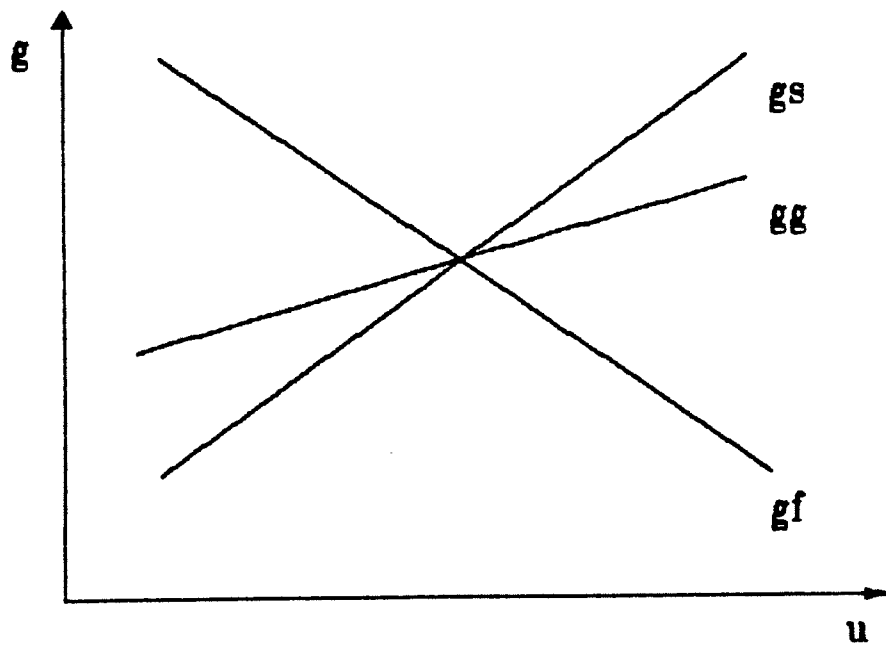


figure 2.2

Higher rates of capacity growth with given current account deficit and fiscal effort parameters, require higher rates of capacity utilization so that matching savings are forthcoming. This locus is shifted upwards by a higher feasible current account deficit, a higher fiscal effort or lower interest payments on the external debt, for example.

The falling locus represent pairs (g,u) which are consistent with balance of payments equilibrium. Higher investment requirements associated with higher growth rates imply smaller rates of capacity utilization so that more room is open to imports of capital goods, for given feasible level of current account deficit and parameters of the imports and exports functions. The locus is shifted upwards with higher external finance, lower interest payments, higher export prices and lower import prices, for example.

A pair (g,u) which satisfies both (gs) and (gf) , may require a level of public investment and public saving which implies a PSBR not sustainable in the long run. Another way to model this would be to add a portfolio balance locus, in which the private sector's preference between fixed capital and government debt determined the level of PSBR, for a given (real) interest rate consistent with the (g,u) pair. Instead, the third locus (gg) was defined as the set of (g,u) consistent with the government budget. For each rate of

capacity utilization (u), there is a corresponding (g) which is consistent with a level of public investment (ie) which exceeds public savings (sg) by an exogenously defined feasible PSBR level (d). The locus may be defined by:

$$ie - sg = d \quad [III]$$

where public savings $sg = z(u) - js$, assuming to simplify that interest payments on the external public debt (js) are constant along the period as a proportion of potential GDP.⁶

This third locus (gg) also has a positive slope because a higher capacity utilization rate (u) leads to more public saving, which are consistent with more public investment and, therefore, a higher growth rate (g). If a pairs (g, u) defined by $(gs) = (gf)$ equilibrium is located above [III], it means that general equilibrium requires a higher deficit financing than was assumed in the construction of (gg). Figure 2.1 depicts a configuration consistent with the three conditions.

Note that a higher (d) in general equilibrium would probably entail a higher real interest. Simulations allowing

⁶ Note that for the purpose of the simulation exercises, the function describing the level of fiscal effort as a proportion of potential GDP was assumed to be $z(u) = z_0 + z_1 \cdot u$, so that increases in public savings may be simulated as increases in $z_0 - js$.

for a complete specification on the role of prices would require of course a much more complex investment and private savings functions. Of course, the fixprice simulations analyzed in the following sections are more interesting if they refer to prices not too far from their equilibrium values.

3. Saving Constraint and Fiscal Adjustment

As suggested before, the present difficulties concerning the politically feasible stabilization policies, after a decade of high inflation and rising uncertainty, imply that the feasible level of capacity utilization in the nineties may be lower than "normal" for price stability. The pattern of short-run stabilization policies should thus take this fact into consideration. In this section alternative solutions for the combination of fiscal effort, public deficit and external finance are examined.

First we consider a solution for the model in which (d) , the public sector borrowing requirement, and (ϕ) , the current account deficit in the balance of payments, were both set equal to zero. According to the definition given in section 2, zero (d) represents no further need for increase in the domestic public debt and that may be important after years of uncertainty about the willingness of the private sector to hold more public debt even at higher interest rates. A (ϕ) equal to zero represents independence from external sources of savings, a reasonable starting point after a period of high external debt.

The basic situation is represented in the in panel 3.1, where the saving constraint is represented in the figure

thereby transferring savings to the private sector, as it has happened in the past when the National Development Bank financed a substantial portion of private investment. In the context of this model this would mean running a negative PSBR. In the present exercise a surplus of $d = -4\%$ of GDP would be sufficient. This combination of policies could be achieved, for example, by an increase in the net tax rate not matched by a simultaneous equivalent rise in public investment, so as to open space in the fiscal budget to finance more private investment.

* In this new exercise, shown in the figure of panel 3.2 the adjustment acts basically upon the saving locus (gs), avoiding an impact on the fiscal locus (gg) that would be unavailing from the viewpoint of faster growth. The growth rate in that figure is still around 3.4%, but now one may note that the same shift upward in the foreign constraint considered before, as a result of making again $(\phi) = 1\%$, would allow an increase in the growth rate to approximately 4%, for very high (u) values.

To make still higher growth rates feasible, or to avoid the need of maintaining high, potentially unstable, rates of capacity utilization, one must combine a more vigorous fiscal adjustment with higher net financial transfers from the public to the private sector, and a move to a more favorable external constraint. In the figure of

by a simple line, the foreign constraint by rectangles connected with lines, and the fiscal constraint by X's connected with lines. It may be seen that the saving and foreign exchange curves jointly determine an equilibrium growth rate of approximately 3.1%, well below the historical 7% average annual rate observed in the period 1940-80. The values for the growth rates, (gs), (gg) and (gf), for (u) values ranging from .8 to 1.0 are also presented in the same panel.⁷

Growth possibilities would change little if more external finance were available leading to higher loci (gs) and (gf). In fact, if it is possible to sustain a current account deficit as high as 1% of GDP, it may be shown that a 3.5% growth rate path could be attained, at very high levels of capacity utilization, and that could be unadvisable to an economy with a recent experience of very high rates of inflation.

For higher growth rates, general equilibrium would require policies that could lead to higher domestic savings, acting jointly upon private savings and the fiscal budget.

⁷ Levels of capacity utilization were estimated defining peaks of full capacity since 1947. In the late seventies the peak years were 1975 and 1977. The average value for (u) in the 1975-80 period was .99. In 1987, the observed value was .8.

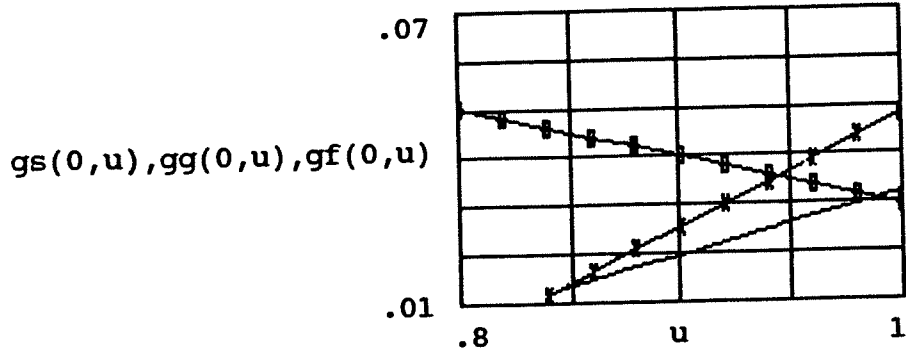
The difference between the amount of public investment required to sustain the equilibrium growth rate and the amount of public saving necessary to match this investment as well as to supplement private saving is not compatible with zero public deficit. An obvious solution would be to run a surplus in order to transfer some public saving to private investors thus shifting downwards the (gg) locus.

A cut in public investment would bring the economy to a point in which equilibrium of savings and investment matches a balance of payments equilibrium. But this form of getting a fiscal surplus is clearly inadequate in the sense that the government budget is adapted to an economy with low savings. Instead, one could increase the fiscal effort in order to boost the economy's overall savings rate.

The pattern of fiscal adjustment, therefore, has to be carefully considered. If the value of the $(z_0 - j_s)$ is increased by 3% of GDP, the growth rate is 3.4%, slightly higher than the 3.1% rate obtained in the first solution. The main difference is that it is consistent with a lower (u) . But the saving locus remains low whereas a substantial slack is introduced in the fiscal budget. There is no point in increasing the investment financing capacity of the public sector if the overall investment financing capacity of the economy remains low. The way out of this situation is to use the slack in the fiscal budget to finance private investment

Panel 3.1

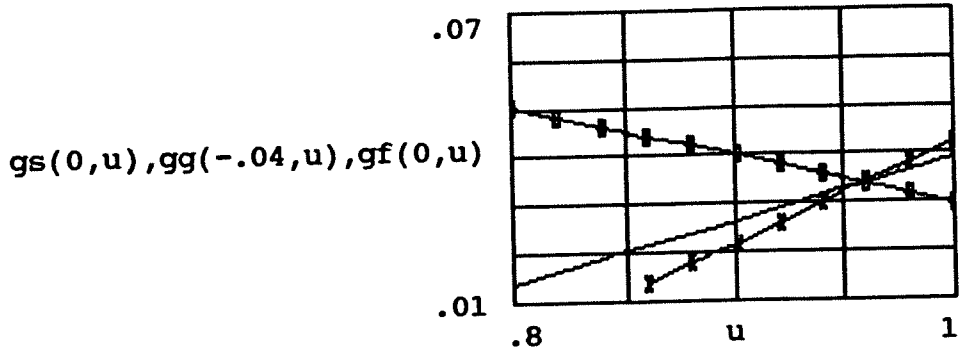
The three loci for zero deficits



u	gs(0,u)	gg(0,u)	gf(0,u)
0.8	0.007	0.003	0.051
0.82	0.01	0.007	0.048
0.84	0.012	0.012	0.046
0.86	0.015	0.016	0.044
0.88	0.017	0.021	0.042
0.9	0.02	0.025	0.04
0.92	0.022	0.03	0.038
0.94	0.025	0.035	0.036
0.96	0.027	0.039	0.034
0.98	0.03	0.044	0.032
1	0.032	0.048	0.03

Panel 3.2

Consequences of a fiscal surplus (-d) of 4% of GDP combined with a 3% of GDP increase in the fiscal effort (z)



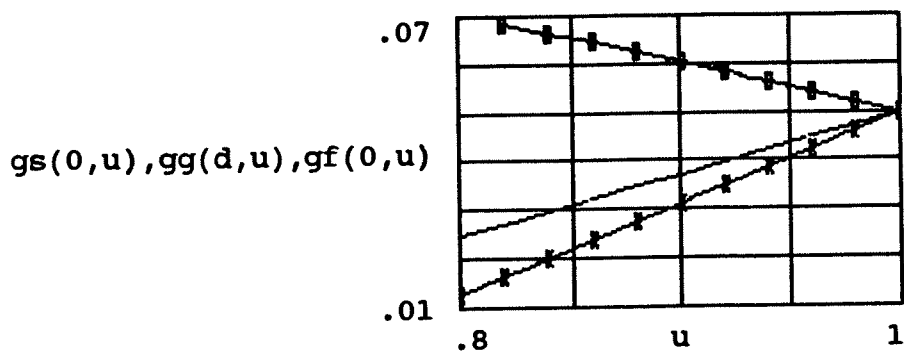
u	gs(0,u)	gg(-.04,u)	gf(0,u)
0.8	0.014	0.001	0.051
0.82	0.016	0.005	0.048
0.84	0.019	0.01	0.046
0.86	0.022	0.014	0.044
0.88	0.024	0.018	0.042
0.9	0.027	0.022	0.04
0.92	0.029	0.026	0.038
0.94	0.032	0.03	0.036
0.96	0.034	0.034	0.034
0.98	0.037	0.038	0.032
1	0.039	0.042	0.03

panel 3.3, one may see the feasible set when one introduces an increase in $(z_0 - j_s)$ of 7.5% of GDP. Most of this fiscal adjustment (6.7%) stems from an increase in the fiscal effort variable (z) . The remainder is generated by a 40% cutback in interest payments on the public-sector's foreign debt, that also contributes to improve the external constraint. If this increase in $(z_0 - j_s)$ is combined with a fiscal surplus $(-d)$ of 7.2% of GDP, an average growth rate of approximately 5% would be attained.

Significantly higher growth rates could become feasible if a higher value were attributed to (z_1) , the parameter measuring the sensitivity of the fiscal effort (z) to the capacity utilization rate (u) . If one assumes a 10% increase in (z_1) , the increase in the fiscal effort variable required to reach a 5% growth rate for the nineties could be equivalent to only 4% of GDP, instead of 6%, as found above. In fact, one could increase (z_1) as a result of policies that enhance the response of the tax burden to (u) .

Panel 3.3

Consequences of a fiscal surplus (-d) of 7.2% of GDP combined with a 6.8% of GDP increase in the fiscal effort (z) plus a 40% reduction in interest payments on public-sector's foreign debt (js)



u	gs(0,u)	gg(d,u)	gf(0,u)
0.8	0.025	0.012	0.071
0.82	0.027	0.016	0.069
0.84	0.03	0.02	0.067
0.86	0.032	0.024	0.064
0.88	0.035	0.027	0.062
0.9	0.037	0.031	0.06
0.92	0.04	0.035	0.058
0.94	0.042	0.039	0.056
0.96	0.045	0.042	0.054
0.98	0.047	0.046	0.052
1	0.05	0.05	0.05

4. Complementarity of Investments, Fiscal Adjustment and Investment Financing

The results of the simulation described in panel 3.3 depend in an interesting way on the degree of complementarity between public and private investments, given by the parameter (α). In that simulation (α) was arbitrarily assumed to be equal to 1.0.⁸

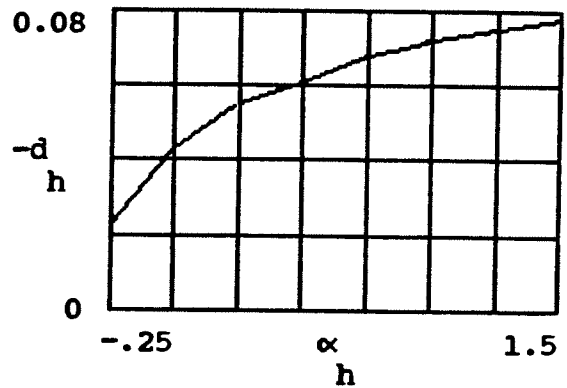
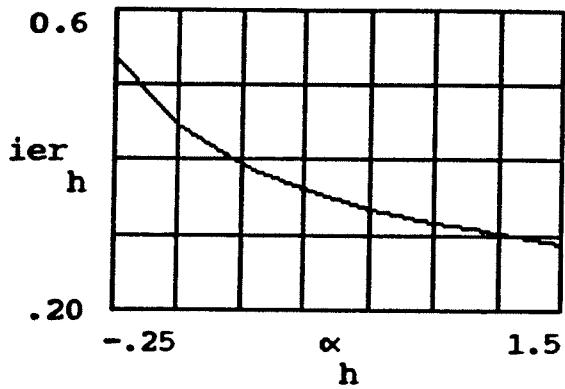
Panel 4.1 below shows how the composition of the aggregate investment and the public financing of private investment depend on the value of (α). The panel presents different values for the fiscal deficit (d), public investment (ie), both as a proportion of GDP, and the share of public investment in total investment (ier). These are values consistent with general equilibrium for alternative values of the parameter (α), ranging from -0.25 to 1.5 , for a 5% growth path and full capacity. As in the simulations described in panel 3.3 above, a fiscal adjustment of 7.5% of GDP was assumed, consisting of an increase of 6.7% of the GDP

⁸ As quoted in Bacha [1990], an econometric analysis of a sample of 72 countries conducted by Barro [1989] led to the conclusion that "an extra unit of public investment induces a one-to-one increase in private investment".

PANEL 4.1

The share of public investment in aggregate investment (ier) and the fiscal surplus ($-d$) depend on the investment complementarity parameter (α)

α h	ie h	ier h	$-d$ h
-0.25	0.12	0.537	0.023
0	0.1	0.448	0.043
0.25	0.088	0.394	0.055
0.5	0.082	0.363	0.061
0.75	0.075	0.335	0.068
1	0.071	0.316	0.072
1.25	0.068	0.302	0.075
1.5	0.065	0.289	0.078



in the fiscal effort parameter z_0 and a cutback of 40% in interest payments on the public-sector foreign debt, corresponding to .8% of GDP.

Less complementarity means that more public investment will be needed to induce enough private investment to attain the aggregate investment ratio consistent with the 5% growth path at full capacity. A lower value of (α) means a less steep $gg(u)$ locus.⁹ To make that locus consistent with the 5% growth path at full capacity, the PSBR will have to be increased (or the fiscal surplus decreased) in order to make room for more public investment. But, as the aggregate investment ratio consistent with the 5% growth path does not depend on (α) , more public investment means less private investment. And that means less need of public funds to finance private investment -- another way of seeing the reason for a lower public surplus.

The fiscal adjustment was designed to provide adequate financing to a higher rate of investment. How the resources generated by the fiscal adjustment will be allocated, between the financing of public and private investment will depend on

⁹ It may be checked in the equations presented on table 2, in the appendix, that a change in (α) affects only (gg) , but not (gf) or (gs) , though it shifts both (if) and (is) .

the degree of complementarity between these two components of aggregate investment.

As may be seen in panel 4.1, the lower the value of (α) , the higher the share of public investment in aggregate investment (i_{er}) and the lower the fiscal surplus ($-d$) as proportion of GDP. When (α) is assumed to be equal to 1.0, the share of public investment in total investment (i_{er}) is 31.6% and the public surplus ($-d$) reaches 6.8% of the GDP. If (α) is made equal to .5, (i_{er}) is increased to 36.3% and $(-d)$ falls to 6.1% of GDP. For (α) equal to zero -- which means to assume that private investment is not directly affected by public investment -- (i_{gr}) is raised to 44.8% and $(-d)$ reduced to 4.3% of GDP. The non-linearity of the schedules shown on panel leads to an amplification of the impact of (α) on those two variables as negative values for (α) are assumed.

5. Final Comments

One obvious limitation of models of the type used here is that the contribution of prices in restoring equilibrium is left out of the picture. And yet, for an observer of the Brazilian economy at the beginning of 1990, price distortions are visible to the naked eye as one would expect in an economy with 60-plus monthly rate of inflation. It should therefore be stressed that the experiments done with the model can only be meaningfully interpreted after removal of the recent aggravation of price distortions due to inflation acceleration (especially the overvaluation of the exchange rate due to lagged indexation, and the pursuit of high positive interest rates for overnight deposits to finance government debt). Price corrections will necessarily play an important role in growth recovery in the Brazilian economy. In fact, the model structural parameters were guesstimated based on average values typical of the mid-eighties.

Useful interpretation of the simulations results should therefore concentrate on what combinations of fiscal policy measures make sense in enhancing the growth possibilities, once the most obvious distortions of high inflation have been removed.

One immediate interpretation of the results is of course that not all austere fiscal policies are defensible from the viewpoint of enhancing the economy's growth prospects. The financial deterioration of the public sector in recent years has encouraged the general recommendation of unqualified "fiscal adjustment" as a pre-requisite for the recovery of development prospects. Much can and has been said in favor of this opinion, but usually the supporting analysis has concentrated on either the inflationary effects of high deficits or in the snowballing character of public indebtedness. In this paper, the post-stabilization challenge is how to restore growth-proneness of the economy, after almost a decade of very low growth following the public sector's financial crisis.

The results of section 3 experiments point to very high levels of required fiscal adjustment even after the most recent distortions caused by either high inflation with lagged indexation of tax revenues or by unrestrained increase in the public sector's payroll have been removed, and public deficit has been reduced to zero. The level of government consumption, for example, taken parametrically in the experiments, was of 8.5% of potential GDP, a figure corresponding to the first half of the eighties, well below the level currently estimated to prevail at the end of the Sarney government. Under these circumstances, an increase in the fiscal effort of 6.7% of GDP, as considered in one of the

exercises above, seems to be a difficult target to aim at, from the viewpoint of political feasibility. It should be noted, however, that it is estimated that a substantial improvement in the government's real revenues, of as much as 3.5% of GDP, may be obtained as consequence of lower inflation alone, leaving another 3.2% to be raised out of higher net tax collection. A good portion of the latter may be achieved through the dismantling of the current system of subsidies and tax expenditures which serves no growth purpose.

The issue of investment complementarity explored in section 4 above, merits some additional attention. First, because it has been more recognized in informal analyses of the problem of public investment than in more analytical arguments. Complementarity was seen to be an issue not of preference for more or less public investment but of the extent to which public investment fosters private investment. The more it does, the less public investment will be required. The simulation results suggest the importance of empirical research on the empirical value of (α) and thus of better knowledge of the determinants of private investment in such economies.

Finally, a substantial improvement on the issues dealt with in this paper could result from the explicit consideration of the asset markets in such models, as done by Fanelli and Frenkel [1989]. Disregard of asset markets may

lead to inadequate interpretations of some results obtained, for example, concerning the nature and implications of the fiscal surplus which is necessary to transfer saving from the (refurbished) government budget to the savings-starved private sector.

Appendix: The Model

The model that is used here is a new version of that presented in Carneiro and Werneck [1990]. The latter follows, with small adaptations, that proposed by Taylor [1988] to serve as a common analytical framework for the recent WIDER country studies on medium term development.

The model's formulation is presented on table 1. All level variables are defined as a proportion of potential GDP. The average annual growth rate (g) is determined in the first equation as a function of aggregate investment. The parameter (k) is the output-capital ratio and (g_0), which would usually be negative, may be associated to a depreciation allowance. In equation [2] it is assumed that private investment (ip) depends upon public investment (ie) and the capacity utilization rate (u) and has an autonomous component (io). If the parameter (α) is assumed to be positive, this means that private investment is crowded-in by public investment for each level of capacity utilization.¹⁰ Total investment, which results from adding up private and public investment, is given by equation [3].

Equation [4] introduces the notion of fiscal effort embodied in the variable z , which is defined as the tax revenue, net of subsidies and transfers, plus public enterprises' operational surplus, less government consumption expenditures and interest payments on the public sector's domestic debt. In equation [4] public sector savings are determined as the difference between the fiscal effort

¹⁰ Note that this does not assume away the possibility of private investment being crowded out by public investment in the short run.

TABLE 1
THE MODEL'S FORMULATION

Average Annual Growth Rate

$$g = g_0 + k.i \quad [1]$$

Private Investment

$$i_p = i_0 + \alpha.ie + \beta.u \quad [2]$$

Total Investment

$$i = i_p + ie = i_0 + (1 + \alpha).ie + \beta.u \quad [3]$$

Public Sector's Savings

$$s_g = z - j_s \quad [4]$$

Fiscal Effort

$$z = z_0 + z_1.u \quad [5]$$

Public Sector's Deficit

$$d.u = ie - s_g \quad [6]$$

Private Savings

$$s_p = \sigma_0 + \sigma_1.(u - z - c_g) \quad [7]$$

Foreign Savings

$$s_f = m + (a_0 + a_1.u) + (\Gamma_0 + \Gamma_1.i) + j_t - (\epsilon_0 + \epsilon_1.u) \quad [8]$$

TABLE 2
SEMI-REDUCED FORM EQUATIONS

Fiscal Budget Consistency Equation

$$ig = (d + z1).u + zo - js \quad [9]$$

Aggregate Investment-Saving Consistency Equation

$$is = \frac{(\sigma1 \cdot (1 - z1) + z1 - \beta) \cdot u + (zo - js + \sigma0 - \sigma1 \cdot (zo - cg)) + \phi - i}{1 + \alpha}$$

External Accounts Consistency Equation

$$if = \frac{-(a1 + \Gamma1 \cdot \beta - \epsilon1) \cdot u + \phi - m - jt - io \cdot \Gamma1 - ao + \epsilon0 - \Gamma0}{\Gamma1 \cdot (1 + \alpha)} \quad [11]$$

Average GDP Growth Rate Implied by Fiscal Consistency

$$gg = go + k \cdot [io + (1 + \alpha) \cdot ig + \beta \cdot u] \quad [12]$$

Average GDP Growth Rate Implied by Investment-Saving Consistency

$$gs = go + k \cdot [io + (1 + \alpha) \cdot is + \beta \cdot u] \quad [13]$$

Average GDP Growth Rate Implied by External Account Consistency

$$gf = go + k \cdot [io + (1 + \alpha) \cdot if + \beta \cdot u] \quad [14]$$

variable (z) and (js), interest payments on the public sector's foreign debt. Another way to interpret equation [4] is to notice that resources (z) generated by the fiscal effort may be channeled to either savings (sg) or to interest payments (js) on the public sector's foreign debt. In equation [5] it is assumed that z is determined by the capacity utilization rate (u) and a coefficient (z_0) which may be changed by fiscal policy instruments. Public sector's deficit is defined in equation [6] as the difference between public sector's investment (ig) and savings (sg). In that equation d is the overall public sector borrowing requirement (PSBR) measured as a proportion of GDP. The product $d.u$ is equal to the PSBR in proportion of potential GDP.

In equation [7] it is assumed that private savings (sp) is determined by the private sector's disposable income for each level of capacity utilization rate (u). To obtain private sector's disposable income one has to subtract from aggregate output, not only the fiscal effort variable (z), but also government consumption (cg). Foreign savings are defined in equation [8] as the balance of payments' current account deficit (ϕ). Intermediate imports are represented by the term $(a_0 + a_1.u)$, capital goods imports by the term $[(\gamma)_0 + (\gamma)_1.u]$ and interest payments on the foreign debt by (jt). Total exports are represented by the term $[(\epsilon)_0 + (\epsilon)_1.u]$, where one would expect $(\epsilon)_1$ to be negative. The algebraic sum of other current account items -- including other imports -- is denoted by m . Again, as already made clear, all level variables are defined as proportions of potential GDP. As may be noticed, intermediate imports and total exports are determined by the capacity utilization rate (u) and capital goods imports by aggregate investment (i).

Table 2 presents semi-reduced form equations, which establish the public investment levels for each level of capacity utilization, relating two variables which are thought to be extremely relevant for the assessment of growth possibilities for the Brazilian economy in the nineties. This may be done by computing public investment as a proportion of GDP for the decade, for given assumptions concerning the structural parameters and policy variables. The sustainable level of public investment has to be consistent, for each level of capacity utilization, with the feasible public sector borrowing requirement, the domestic rate of savings and the feasible balance of payments current account deficit.

Equation [9] determines, for each rate of capacity utilization (u), the value of public investment (ig) which is consistent with a given PSBR value (d). Substituting the value of z in equation [5] into [4] and using the resulting expression for (sg) in [6], one gets equation [9], after rearranging terms. The notation (ig) is used in that equation in order to make it clear that what is involved is the level of public investment consistent with the public budget.

Making the expression for aggregate investment (i) in equation [3] equal to aggregate saving, defined as the sum of the left hand side of equation [8] and the right hand sides of equations [7] and [4], after substituting in the latter the value of (z) given by [5], one gets equation [10], after rearranging terms. Public investment is designed by (is) in [10] in order to make it clear that the equation establishes the public investment value which allows aggregate investment to be consistent with aggregate savings. For a given assumption about the value of foreign savings available (ϕ), that equation sets the value of (is) consistent with each value of the capacity utilization rate (u).

Equation [11] determines the level of public investment that is consistent with the external accounts, given a current account deficit (ϕ). It is obtained by simply substituting the expression for aggregate investment (i), given by equation [3], into equation [8], and rearranging terms. In equation [11], the public investment variable is denoted by (if), since what is being taken into account is the current account consistency. For a given assumption about the feasible current account deficit (ϕ), it determines the maximum value of public investment consistent with each value of the capacity utilization rate (u).

Equations [12], [13] and [14] establish the average annual growth rates which would be allowed by each of the previous three consistency equations. To get them, one has simply to substitute the value of aggregate investment (i), given by equation [3], into [1], and to consider in the resulting expression, one at a time, the three public investment values established by equations [9], [10] and [11]. In the frontiers loci are obtained, the GDP growth rates consistent with different values of (u) are designed (gg), (gs) and (gf), depending on which consistent equation is being considered in each case.

In order to use the model for simulations, plausible values were attributed to the parameters and exogenous variables. Typically, the values of the parameters in the one-variable linear equations were obtained on the basis of known passage points and plausible elasticity values. The elasticities of total exports and intermediate imports with respect to capacity utilization were assumed to be equal to 2.0 and .5, respectively. The elasticity of capital goods imports with respect to total investment was assumed to be equal to 2.0. A value of 4.0 was initially assumed for the elasticity of public sector savings with respect to capacity utilization. In the case of private sector savings the corresponding elasticity was assumed to be equal 2.0.

For the simulations of section 3, the value of (α) was set at 1.0 and the value of (β) at .2. Given the

difficulty of making a definitively convincing assumption about the parameters of the private investment behavior equation [2], an extensive analysis of the sensitivity of the results to different hypotheses about the parameters (α) and (β) was carried out in Carneiro and Werneck [1990]. When other values were attributed to (α) in the simulations analyzed in section 4, a known passage point was used to (endogenously) define values consistent with these hypotheses to the linear coefficient (λ). Finally, the value attributed to (k) was consistent with the assumption of an incremental capital-output ratio equal to 3.5, and the value of (g) with the assumption of depreciation being equivalent to 5% of the potential GDP.

References

Aschauer, D. [1988a]. "Is Public Expenditure Productive?", Staff Memorandum 88-7 (Federal Reserve Bank of Chicago, Chicago, IL.)

Aschauer, D. [1988b]. "Does Public Capital Crowd Out Private Capital?" Staff Memorandum 88-10 (Federal Reserve Bank of Chicago, Chicago, IL.)

Bacha, E. [1990]. "Three-Gap Model of Foreign Transfer and GDP Growth Rate". Journal of Development Economics, 32.

Barro, R. [1989]. "A Cross-Country Study of Study of Growth, Saving and Government". Working Paper no. 2855 (NBER, Cambridge, MA).

Carneiro, D. D. [1987]. Brazil, Country study n. 11, Stabilization and Adjustment Programmes and Policies, WIDER/UNU, Helsinki.

Carneiro, D. D. and R. L. F. Werneck [1986]. "Investment Behaviour and Recession in Brazil", Rio de Janeiro, December, mimeo..

Carneiro, D. D. and R. L. F. Werneck [1988]. "External Debt, Economic Growth and Fiscal Adjustment", Texto para Discussão n. 202, Departamento de Economia, PUC-RJ, agosto. Forthcoming in Pesquisa e Planejamento Econômico, April, 1990.

Carneiro, D. D. and R. L. F. Werneck [1990]. "Brazil: Growth Exercises for the Nineties", revised version, mimeo.

Fanelli, J. M., R. Frenkel and C. Winograd [1989]. "Growth Exercises for Argentina", Cedes, Buenos Aires, August, mimeo..

Modiano, E. M. [1989]. "A ópera dos Três Cruzados" in M. P. Abreu (ed.). A Ordem do Progresso: Cem Anos de Política Econômica Republicana. Rio de Janeiro: Editora Campus.

Sedlacek, G. L. and R. P. Barros (eds.) [1989]. Mercado de Trabalho e Distribuição de Renda: Uma Coletânea. Rio de Janeiro: IPEA-INPES.

Taylor, L. [1988]. "Memo to Country Paper Authors", Helsinki, mimeo..

Werneck, R. L. F. [1986]. "Poupança Estatal, Dívida Externa e Crise Financeira do Setor Público", Pesquisa e Planejamento Econômico, December.

Werneck, R. L. F. [1987a]. "Retomada de Crescimento e Esforço de Poupança: Limitações e Possibilidades", Pesquisa e Planejamento Econômico, Vol. 17, N. 1, April

Werneck, R. L. F. [1987b]. "Public Sector Adjustment to External Shocks and Domestic Pressures in Brazil, 1970-1985", Texto para Discussão n. 163, Departamento de Economia, PUC-RJ, June.

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