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On Growth and Inflation in Developing Countries

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Summary

The relationship between inflation and economic growth in the developing countries has been discussed within the context of structuralism, the inflationary financing of government investment and inflationary financing of private investment. According to structuralists, due to various rigidities and inelasticities in the economic environment of the developing countries, inflationary pressures will build up during the growth process and the banks and monetary authorities must react passively to such pressures if potential economic growth is to be fully realized. In models involving inflationary financing of government investment, it is implicitly assumed that increases in inflation raise government expenditure relative to GDP, raise government investment spending relative to total government expenditure, as well as total domestic investment in relation to GDP, ensuing in an increase in real GDP growth. The case for inflationary financing of business investment involves the expectation that the investment-income ratio increases with inflation, which in turn depends on the dual condition that a rise in the rate of inflation leads to a fall in real wages, ceteris paribus, and that the marginal propensity to save of wage earners is less than that of profit earners.

The empirical evidence does not indicate that the conditions (of the above approaches) for positive relation between changes in growth and changes in inflation have, in general, been realized, once the average rate of inflation is maintained above modest levels. More specifically, past empirical work seem consistent with the view that low-inflation countries perform better than high-inflation countries as regards real GDP growth; but some of that evidence appears to show that up to a certain relatively low level of inflation, increases in inflation tend to be positively correlated with increases in growth. The paper presents results for 86 developing countries covering the period 1974-83; using pooled cross-section time-series (annual) data it is found, for example, that a 1 percentage point increase in the inflation rate was associated, during the period, with, ceteris paribus, an 0.074 percentage point decrease in the growth rate. On the basis of examination of the data, the major sources of the overall negative correlation appear to have been (1) a negative correlation between changes in inflation and changes in the ratio of government expenditure to GDP; and (2) the tendency for the real effective exchange rate to increase its rate of appreciation as inflation increased.

The sample was split into low-inflation countries (30 countries with average inflation rates, during the period, of less than 11 percent), medium-inflation countries (35 countries with average inflation of 11 percent to 20 percent) and high-inflation countries (21 countries with average inflation rates exceeding 20 percent). The low-inflation countries revealed no significant relation between changes in inflation and changes in growth, while the other two subsamples showed a negative relation. The negative relation appears to have been stronger for the middle-inflation countries. It is hypothesized that this may be attributable to greater

uncertainty, regarding the future course of inflation, in the medium-inflation countries, and/or to more complete adaptation to the generally high level of inflation in the high-inflation group.

I. Introduction

The association between inflation and economic growth in developing countries (LDCs) has been the subject of interest and debate for several decades. There appears, by now, to be widespread agreement that continuously increasing inflation is bad for economic development and growth. But is some inflation always bad for growth in the LDCs? Is some inflation inevitable in the growth process in the LDCS? Why does a given level, or change in, inflation seem to have different growth consequences in different countries? Finally, suppose an attempt is made to reduce inflation but associated social costs dampen the speed with which it can be done, how can any adverse growth consequences of living with inflation be reduced? In order to throw some light on some of these issues, this paper examines the nature and economic content of the hypothesis postulating that inflation up to a point can be beneficial to growth in the LDCs, some of the theoretical criticisms that have been levied against optimistic versions of the hypothesis, and the empirical implications, as well as some cross-country evidence.

Even this hypothesis as it stands raises a number of issues and it is necessary to be more specific in at least two aspects. In the first place, the paper is not concerned with the relationship between the long-term average rates of inflation and growth. Rather, it focuses on the relationship between changes in the rate of inflation and changes in the rate of growth. In the second place, the paper is concerned with annual changes. One interesting issue ignored by these two restrictions is whether a particular country that has experienced two periods, each of, say, three to ten years in duration marked by significantly different average inflation rates, also realized significantly different growth rates between the two periods, and, if so, whether the difference in growth rates was related to the fact of the difference in average inflation rates.

The case for positive inflation in order to enhance growth in the LDCs has traditionally been made in the context of structuralism, and inflationary financing (1) of government investment and (2) of private investment. In Sections II-IV the theoretical arguments and some of the limitations and crucial implicit assumptions of these approaches are given. Section V discusses the empirical implications of the approaches and the conclusions of several authors who have looked especially at the cross-country data, after which new evidence for a sample of 86 countries covering the period 1974-83 is presented. The final section contains some concluding remarks.

II. Structuralism

According to the structuralist view of inflation, a positive relation between inflation and growth, at least up to a certain rate of inflation, is an inescapable one, barring radical and fundamental changes in the structure of the economy. This relation is not the consequence of economic policy on inflation but rather a constraint on what is achievable through policy measures. There is, in short, an inevitable trade-off between inflation and growth.

The argument of the structuralists is that various rigidities and inelasticities in the economic environment of the developing countries lead to a build-up of inflationary pressures from the real side during the growth process and the banking system must validate such pressures if potential economic growth is to be fully realized--indeed, in some cases, if losses in output are to be avoided. 1/ There are three important aspects to this argument. First, that due to factor immobility and downward rigidity of factor-prices, upward movements of wages and prices are required to reallocate labor and other resources; this is particularly necessary to attract labor out of traditional (including subsistence) sectors and into developing (or so-called modern) sectors of the economy. Second, due to supply inelasticities in agriculture the increase in demand for food resulting from development in other sectors, as well as from population growth, will tend to push up the relative price of food. Again, downward price rigidities in the economy will tend to translate such relative price changes into absolute price increases at given levels of employment and output in the modern developing sectors. Third, due to inelasticity of demand for (traditional) exports of the typical developing country, foreign exchange earnings from such exports cannot rise fast enough either to finance the growing requirements for food imports or to satisfy the demand for imports of intermediate goods by producers of export-oriented and purely domestic goods. Consequently, import substitution is required, and, in light of the low degree of comparative advantage of the country in some of these import substitutes, costs of production will be quite high, creating inflationary pressures.

Typically, in the structuralist framework the price level in the industrial sector is set according to some mark-up over the nominal wage. The nominal wage is based on labor's desired real wage and the aggregate price level. These factors lead to an equilibrium relative price between agricultural and industrial goods consistent with labor's required real wage (see, e.g., Cardoso). In such a framework, growth in the industrial

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1/ For a discussion of the structuralist view on inflation, particularly in the Latin American context, see Campos, Herrick and Kindleberger, H.G. Johnson and Wachter.

sector, which alters the relative price between agriculture and industry and raises the absolute price level, will influence the wage rate in the industrial sector, leading to an upward rise in industrial prices and giving further impetus to the rise in the aggregate price level.

A good part of the structuralist analysis has been concerned with formalizing the relation between the relative price of food and the inflationary process. Now assume two sectors, agriculture (A) and industry (I). Let the aggregate price level (P) be a linear homogeneous function (or geometric average) of the price level in agriculture (P_A) and in industry (P_I). That is,

$$P = P_A^{\alpha} P_I^{1-\alpha} \tag{1}$$

$0<\alpha<1$.

Taking percentage changes (indicated by circumflex accents) we have

$$\hat{P} = \alpha(\hat{P}_A - \hat{P}_I) + \hat{P}_I = \alpha\hat{P}^* + \hat{P}_I \tag{2}$$

where $P^* \equiv P_A/P_I$.

Thus, the rate of inflation can be specified as a function of the rate of change of the relative price between the two sectors and of the absolute price in the industrial sector.

A fundamental hypothesis of (Latin American) structuralism is that the relative price of the agricultural good (A) must increase with growth, in a certain type of LDC. This is so for at least two reasons. One is that growth in sector A is relatively slow; the other is that the price reaction to excess demand is much greater in agriculture than in industry, as regards both the speed of price response to the emergence of excess demand (positive or negative) and the elasticity of price with regard to the change in excess demand.

Now equilibrium in the agricultural sector requires equality of supply and demand. Assuming that autonomous demand grows at rate ψ and supply at rate ϕ , then in equilibrium

$$\psi - \phi - \hat{P}^* (\eta + \varepsilon) = 0 \tag{3}$$

where η and ε are the price elasticities of demand and supply respectively.

Thus

$$\hat{P}^* = \frac{\psi-\phi}{\eta+\varepsilon} \tag{4}$$

Consequently, equation (2) can also be written as

$$\hat{P} = \alpha\left(\frac{\psi-\phi}{n+\varepsilon}\right) + \hat{P}_I \qquad (5)$$

as shown by Olivera and Canavese. 1/ In other words, inflation is accompanied and affected by increases in the relative price of the agricultural good.

Alternatively, suppose that k_A and k_I represent the coefficients of price reaction to excess demand in agriculture and industry respectively; these coefficients are, in effect, indicators of both the speed and elasticity of response of price to a one percentage change in excess demand. Then

$$\hat{P}_A = k_A\hat{D}_A$$

and (6)

$$\hat{P}_I = k_I\hat{D}_I$$

where D_i represents excess demand in sector i. Consequently,

$$\hat{P}^* = k_A\hat{D}_A - k_I\hat{D}_I \qquad (7)$$

so that equations (2) and (5) can also be written as

$$\hat{P} = \alpha(k_A\hat{D}_A - k_I\hat{D}_I) + \hat{P}_I \qquad (8)$$

It is hypothesized, of course, that $k_A > k_I$.

Consider now a situation in which excess aggregate demand does not exist, so that $\alpha\hat{D}_A = -(1-\alpha)\hat{D}_I$. If then prices behave according to equation (6) we have

$$\hat{P}_I = k_I\hat{D}_I = -k_I\hat{D}_A\left(\frac{\alpha}{1-\alpha}\right)$$

so that substituting for $\hat{P}_I$ in equation (8) yields

$$\hat{P} = \alpha\hat{D}_A(k_A-k_I) \qquad (9)$$

Equation (9) is consistent with the Wachter result that the inflation rate depends on the distribution of excess demand between the two sectors,

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1/ See Canavese (1982). Some aspects of the economics of passive money in this general context is discussed in Olivera (1971).

even in the absence of excess aggregate demand (Wacher, 1976), and this result depends crucially on the differential price reaction coefficients emphasized by Wachter. This can be seen by setting $k_A = k_I$ in equation (9).

In principle, we can divide the growth in excess demand in agriculture as emanating from growth in excess supply in industry (due to productivity changes or autonomous investment or consumption) matched by excess demand for the agricultural good ($\hat{D}^o_A$) and growth in excess demand (D_g) (due to credit creation to finance budgetary deficit or private sector activity). Thus

$$\hat{D}_A \equiv x\hat{D}_g + \hat{D}^o_A \tag{10}$$

where x is the income elasticity of demand for the agricultural good. In that case

$$\psi' = x\hat{D}_g + \hat{D}^o_A = x\hat{D}_g + \psi$$

so that

$$\hat{P}^* = \frac{x\hat{D}_g + \psi - \phi}{\eta + \varepsilon} \tag{11}$$

Equation (5) then becomes

$$\hat{P} = \alpha\left\{\frac{x\hat{D}_g + \psi - \phi}{\eta + \varepsilon}\right\} + \hat{P}_I \tag{12}$$

It is clear from equation (12) that even within the structuralist framework inflation can be attributable to pure structuralist factors ($\psi - \phi$), excess demand pressures ($\hat{D}_g$), and to cost-push factors in industry ($\hat{P}_I$). 1/ To observe that a given inflation rate is proceeding hand-in-hand with growth is not to establish that the inflation rate is the result only of structural factors in the growth process.

In general, the stucturalist view suffers from serious theoretical and empirical shortcomings and overstatements. Although a full discussion of the weaknesses in the structuralist explanation is not a purpose of

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1/ It needs to be noted that, in general, $\hat{P}_I$ will change also because of excess demand pressures. This, of course, is not denied by structuralists.

this study, it is useful to note that some of the rigidities and inelasticities emphasized by the structuralists may have been "induced," being the consequence of a history of inflation stemming from other sources, inappropriate exchange rate policies, and price and exchange controls. Moreover, many believe that, stripped of its overstatement and inaccuracies, the argument may not, for the typical developing country, "justify" an inflation rate of more than 4-10 percent. 1/ It must be realized, though, that such assessments implicitly assume a zero rate of "world inflation," a process which even such critics agree exist. 2/ In that case, the 4-10 percent may be said to be over and above whatever is considered to be "the" world inflation rate.

III. Inflation Tax

Inflationary financing and growth

An argument of the inflationary finance and growth literature 3/ is that government expenditure has real effects; in particular, a good fraction of the investment expenditure with the highest social marginal returns, taking into account external economies generated, will, in many developing countries, have to be made by the government (including the public enterprises). To the extent that the normal channels of taxation are "undeveloped," "inadequate," or "inelastic" (to choose expressions that have been frequently employed), under zero inflation the share of national resources available to the government to expend on socially profitable investment projects may remain far less than optimal. In such cases the well-known "inflation tax," consequent upon the inflation produced by relatively rapid base (or high-powered) money creation by the monetary authorities, will make additional real resources available for use in the development process, even where the inflation is fully anticipated. In this framework, therefore, the relation between inflation and growth is a consequence of economic policy, and inflation is a direct policy instrument.

For instance, suppose the government issues additional high-powered money (H) in order to make investments G_T. Then

$$\frac{dH}{dt}\cdot\frac{1}{P} = \frac{dK}{dt} \qquad (13)$$

where K is real capital; it is important to note that private capital

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1/ See, for example, Harberger (1964) and H.G. Johnson.
2/ See, for example, Harberger (1978).
3/ See especially Aghevli (1977), and Mundell (1971) Chapter 4.

in this model is not at all affected by government investment (i.e., crowding out does not occur). Suppose that

$$y = k.K$$

where k is the output-capital ratio and y is real output. Then

$$\frac{dy}{dt} = k\,\frac{dK}{dt} = \frac{(dH/dt).k}{P} \tag{14}$$

Also using the definition $\hat{y} \equiv \frac{dy}{dt}.\frac{1}{y}$, the result is obtained that

$$\hat{y} = \frac{(dH/dt).k}{Py} = \frac{(\hat{H}.H).k}{Py} \tag{15}$$

where $\hat{H}$ is the rate of change of high-powered money.

Let V_h be the income velocity of high-powered money and assume that it is constant. Also noting that, in equilibrium, with constant velocity, we have

$$\hat{M} = \hat{P} + \hat{y} \tag{16}$$

and $\hat{M} = \hat{H}$

where $\hat{M}$ is the rate of change of the money stock. The above implies that, in equilibrium,

$$\hat{y} = \frac{1}{V_h}.k(\hat{P} + \hat{y})$$

or

$$\hat{y} = \hat{P}\,\left(\frac{k}{V_h - k}\right) \tag{17}$$

From equation (17) the rate of real GDP growth is seen to vary directly with the inflation rate, given V_h and k. But, in general, velocity will tend to increase with the rate of inflation ($\hat{P}$). If it is hypothesized that a log-linear relation exists such that $V_h = ae^{\alpha\hat{P}}$ where a and α are constants, substituting for $V_h(=Py/H)$ in equation (15) will indicate that

$$\hat{y} = \hat{H}\cdot k\left(\frac{e^{-\alpha\hat{P}}}{a}\right) \tag{18}$$

The above results are obtained by assuming that the government invests the proceeds of the real high-powered money it issues, and that real savings (and investment) increase by the amount of the real high-powered money. Thus the savings-income ratio is increased by the inflation tax. 1/

In general, of course, inflationary financing of government deficits cannot be said to be due to current or capital expenditures of the government; for what is being financed is simply an excess of government expenditure (current and capital) over government (normal) tax and nontax receipts. In addition, it is not always the case that from the viewpoint of contribution to growth some expenditures classified as current are less productive than certain expenditures called capital. A typical case in point would be where investment in health and schooling--so-called investment in human capital--are more productive in terms of their contribution to real GDP growth than many prestige projects, particularly in construction, included in capital expenditure. Furthermore, starting from some level of the government budget deficit, say, relative to GDP, considered noninflationary, such deficit can increase, not because of domestic investment or apparently growth-generating "current" expenditure, but because of government subsidies promoting certain distributional goals. Or, the deficit can increase because of an inflationary surprise--say, due to an external shock--while the government tries to maintain its expenditure in real terms; the increase in government expenditure then perpetuates the deficit and the inflationary process, taking into account that government revenues can fall behind in real terms in many of these LDCs as a result of collection lags, the structure of expenditure and revenue, government response to inflation, and other factors (Aghevli and Khan (1978), Goode (1984) pp. 221-24 and Heller (1980)).

Taking all these caveats into consideration, the inflationary finance and growth thesis can be said to imply that the greater the change in the ratio of government investment or capital expenditure to total government expenditure (GKT), the greater the marginal efficiency of government investment, and the smaller the crowding out of private investment ensuing from an increase in government investment relative to GDP, the greater will be the increase in growth ensuing from a marginal increase in inflation through inflationary financing of government investment (i.e., the greater will be $\partial \hat{y}/\partial \hat{P}$).

Inflation and real tax revenue

Recently Tanzi has emphasized, also, that the inflationary finance and growth hypotheses must incorporate the effect of inflation on the

1/ Much of the Mundellian type of analysis is concerned with finding the rate of inflation or monetary expansion at which growth is maximized (see, e.g., Mundell op. cit., and Calvo and Peel), or at which the discounted flow of total consumption is maximized (see Aghevli).

existing tax system. 1/ Abstracting from discretionary changes in tax rates, the argument is that inflation lowers the real value of normal tax receipts and the net contribution of inflationary finance to government revenue must incorporate this reduction. What is important is the ratio of inflation tax revenue plus normal tax revenue relative to GDP, and an interesting analytical question is the rate of inflation at which this total revenue is maximized. Tanzi showed the importance of the built-in elasticity of the tax system and the length of the collection lag for the revenue-maximizing rate of inflation; he also showed that such a rate was not necessarily identical with that at which the pure revenue from inflationary finance was maximized relative to GDP.

Of course, it should be underlined that discretionary changes may be made in the tax system (Heller) so that what is ultimately relevant is a total elasticity that incorporates such changes. But it is not always clear that such discretionary changes will have a net effect of increasing the ratio of tax revenue to GDP. Some changes will have such an effect as, for instance, when specific tax rates are modified sufficiently and on a timely basis to prevent deterioration in the real values of their yields. But other changes may have just the opposite effect, as when income tax rates are adjusted to reduce the real burden of taxation on certain income groups.

Since government expenditure financed from domestic sources will be from normal tax and nontax revenue, as well as from inflationary and noninflationary sources of deficit financing, it is quite likely that within any given time period increases in inflation due to inflationary financing result in increases in the ratio of government expenditure to GDP only up to a certain rate of inflation. 2/ That is,

$$\frac{\partial(G_E/Y)}{\partial \hat{P}} = h_o - h_1 \cdot \hat{P} \qquad (19)$$

where G_E is government expenditure and Y is GDP, while h_o and h_1 are constants. The above relation (19) incorporates the effects of collection lags, built-in elasticity of the tax system, discretionary changes and inflationary finance. The ratio h_o/h_1 will indicate the rate of inflation beyond which further increases lead to a drop in the G_E/Y ratio.

1/ See especially Tanzi (1978). But see also Tanzi (1982) for a summary of the issues relating to fiscal disequilibrium in developing countries.

2/ Note that government expenditure is equal to government revenue plus government borrowing.

What had been said earlier about inflationary finance, government investment, and growth, would, therefore, require some modification. The hypothesis can be restated as follows: as long as $\partial(G_E/Y)/\partial\hat{P}>0$ and the ratio of government investment to total government expenditure increases with government expenditure, growth will tend to be positively related with the inflation consequent upon inflationary financing of government expenditure. Economic policy can therefore influence the relation between inflation and growth by ensuring that the actual rate of inflation does not go beyond h_0/h_1, in equation (19), i.e., the rate of inflation at which $\partial(G_E/Y)/\partial\hat{P}$ becomes zero.

Open economy considerations

It is recognized that conclusions regarding inflationary finance and growth must be modified in an open economy. 1/ There are at least two important reasons for this. First of all, the typical developing country imports a substantial fraction of the intermediate and capital goods required for production and investment. Consequently, a government that is able to obtain significant resources from the inflation tax would still need to obtain foreign exchange to purchase intermediate and capital goods to implement its investment projects. In the absence of external loans and grants to cover all such expenditures in foreign exchange, the proceeds from the inflation tax must be spent partly or wholly in foreign exchange. Secondly, with an inflation rate that is rapid relative to inflation rates of trading partner countries, the prices of nontraded goods are increasing relative to those of traded goods, thereby tending to induce productive resources to shift toward the former from the latter. In contrast, domestic households and firms are encouraged to shift demand away from nontraded to traded commodities and factors of production.

For our purposes, the implication is that, given a relatively high domestic inflation rate, the need to avoid serious losses in foreign exchange and the desire to prevent relative price changes between traded and nontraded goods that are not dictated by fundamental changes in factor endowments, in factor productivity or in tastes, downward adjustments of the exchange rate would need to accompany the inflationary process. The increase in growth resulting from a marginal increase in inflation will be greater, the smaller the appreciation in the real effective exchange rate accompanying inflation.

1/ See, for example, O.E.G. Johnson (1976), where it is argued that in an open economy the inflationary financing choice becomes inflationary financing cum currency depreciation.

Inflation tax, real interest and growth

von Furstenberg (1982) has shown that, under conditions which, he argues, normally prevail in the typical developing country, anticipated increases in the rate of growth of high-powered money resulting from government finance will tend to raise the real rate of interest and this will adversely affect real output (income) growth through the effect on the desire to accumulate wealth in the private sector.

In the von Furstenberg framework, the key variables are the real rate of interest (r), equivalent to the real rate of return required by private decisionmakers on claims to business and consumer capital, and Tobin's q, defined as the ratio of the market value of ownership claims to physical assets to the replacement costs of those assets. A rise in q indicates a decline in required rates of return on private capital relative to actual rates of return (and vice versa for a decline in q); a decline in q is associated with a rise in the real interest rate. An increase in the rate of growth of high-powered money in order to finance government expenditure, which also raises the rate of growth of money, is assumed in this model to lower q because of increased risk relating to the possibility of increased instability of future government policies and of rates of return on private physical capital. The decline in q in turn increases r. In short, the following hold (with $m \equiv \hat{M}$, the rate of growth of money):

$$r = r\,[q(m)] \tag{20}$$

such that $dr/dm = \frac{\partial q}{\partial m} \cdot \frac{\partial r}{\partial q} > 0$

where $\partial q/\partial m < 0$ and $\partial r/\partial q < 0$.

Desired private wealth (or net worth), W_d, is specified as a positive function of income (output) 1/ and a negative function of the real rate of interest. That is,

$$W_d = W_d(Y,r) \tag{21}$$

such that $\partial W_d/\partial Y > 0$ and $\partial W_d/\partial r < 0$.

There is also a private savings function which states that private saving varies positively with the excess of desired wealth over actual wealth (W^*), where the rate of adjustment of W^* to W_d, which is symbolized by s in equation (22), is between zero and unity. Hence,

$$S = s.\,[W_d(Y,r) - W^*] \tag{22}$$

where

$$0 < s < 1.$$

1/ In this section, the symbol Y is used to represent both the nominal and real income (output or GDP).

Wealth of the private sector is defined, in equation (23) as the sum of (1) high-powered money (H), (2) net debt of the public sector to the private sector (B), (3) the replacement cost of nationally-owned business physical capital (net fixed assets plus inventories), defined as total business capital (KB) less the fraction (f) owned by foreigners, (4) the replacement cost of physical capital owned by households, which is assumed here as bearing some fixed relation (ρ) to business capital, and (5) the market value of assets such as land that are non-depreciating; KB is adjusted by q to take account of any difference between the market value of claims to physical assets and the replacement cost of those assets. In short,

$$W^* = H + B + q \cdot (1-f)(1+\rho) \cdot KB + L \qquad (23)$$

where $0<\rho<1$.

The actual and desired business physical capital (KB and KB_d respectively) are related to W_d by the coefficient $s_k(=s_{kd})$ measuring the ratio KB_d/W_d desired by private holders of wealth. An increase in the rate of money creation is assumed to engender an increase in s_{kd}. This can be summarized by the following equation where the parameter s^0_{kd} takes account of other (exogenous) factors affecting s_{kd}:

$$KB = KB_d = s_k \cdot W_d = s_{kd}\,(m, s^0_{kd}) \cdot W_d \qquad (24)$$

such that $0<s_k<1$ and $\frac{\partial s_{kd}}{\partial m} > 0$.

The system is completed below by equation (25) which defines the saving-investment equilibrium and by equation (26) which relates output (income) to the stock of physical capital including, for completeness, the physical capital of the government (KG). S denotes private savings in equation (25) while, as before, the output-capital ratio is expressed by k in equation (26). Equation (25) in effect states that savings is the sum of the change in business and household capital stock, i.e. $(1-f)(1+\rho)\ \Delta KB$ plus the change in high-powered money (ΔH) plus the change in public debt holdings of the private sector (ΔB). That is

$$S - \Delta B - \Delta H = (1-f)(1+\rho)\Delta KB. \qquad (25)$$

Equation (26), the output equation, is stated as:

$$Y = k \cdot [(1+\rho)KB + KG]. \qquad (26)$$

Assume now that with regard to equations (20)-(26) we are in a situation of equilibrium such that money is growing at a constant rate and the rate of inflation is zero. In that case, the change in the rate of growth of money is zero and equation (20) is not relevant. Changes in nominal and real values are also the same. Suppose now the government announces and implements a policy of financing part of its expenditure through inflation tax, thereby increasing the rate of growth of money. Consider a once-for-all but permanent increase in this rate of growth of money; how does real GDP in the new steady-state compare with the original real GDP? The argument of the von Furstenberg-type of analysis, as can be seen from equations (20)-(26), is simply that the once-for-all permanent increase in high-powered money growth, in this fashion, will tend to lower q, raise r, diminish desired real wealth (W_d), and raise s_k. If the negative relation between W_d and r is rather strong, it could lead to $s_{kd} \cdot W_d$ declining so that real desired and actual private physical capital ($KB_d = KB$) falls in the new long-run equilibrium. The result would be that Y declines from what it would have been.

In the above model, government physical capital is not financed by any of the receipts from inflationary finance and hence the decline in KB is not counterbalanced by sufficient increase in KG. This assumption is considered more realistic by von Furstenberg, implying that inflationary finance is for the purpose of government consumption expenditures. But even if KG increases with the receipts, he assumes that the "measured" productivity of public capital is only a fraction of that of private capital. Further still, if the B/W ratio desired by the private sector is constant, the decrease in W lowers B and hence KG, given that KG is affected by B (all measured in real terms, of course).

IV. Inflationary Financing of Business Investment

In the inflation tax framework, high-powered money creation is typically for the purpose of financing government investment. But there is also another tradition, particularly implicit or explicit in the discussions of selective credit controls as instruments of development policy (see O.E.G. Johnson (1974)), in which high-powered money is created for the purpose of financing investment in the private sector. More specifically, the central bank could make funds available to commercial banks for on-lending to private businesses for investment, and/or the central bank could rediscount commercial bank paper in order to improve the liquidity position of the commercial banks, permitting the latter to make additional loans for investment purposes.

Where there are idle or underemployed resources that can be quickly and efficiently mobilized by those who have been privileged to get additional bank loans, no inflation need ensue from the additional high-powered

money creation. The question of inflation arises when resources must be enticed away from consumption goods and forced saving must occur. In particular, the additional lending to business is assumed to increase the desired investment in the private sector. The increased aggregate demand raises the price level. In this model, it is also assumed that wage increases lag, and are smaller than, the price increases ensuing from the above process. This then raises the profit share in the private sector, lowers real consumption by households, and increases real saving, since the marginal propensity to save of profit earners is assumed to be greater than that of wage earners. The process must continue until the increased real saving equals the increased real investment desired by business.

An implication is that the saving-income ratio is, in the aggregate, increased by this type of inflationary financing policy. In other words, as stated above, inflation is assumed to transfer income from wage earners as a group, to profit earners, as a group; it is then assumed that the saving-income ratio of the wage earning group declines while the saving-income ratio of the profit-earning group increases. For the aggregate saving-income ratio to increase, it follows that at any given level of real income the increased saving of the profit earners must be greater than the decrease in saving of the wage earners. A Kaldorian-type situation is therefore implicit in this sort of analysis.

In short, the inflationary financing of business investment supposedly permits an effective redistribution of income from wage earners (and consumers) to profit earners as well as an effective increase in the savings ratio, S/Y, where S is saving and Y is GDP. As an example of models in this area of analysis consider the following framework of Thirlwall (1978). Utilizing a savings function of the Kaldor type, $S = s_w W + s_r R$, Thirlwall specifies the following saving function at time t:

$$S_t = s_w W_o e^{wt} + s_r (Y_o e^{\hat{P}t} - W_o e^{wt}) \tag{27}$$

where s_w and s_r represent the marginal propensity to save out of wages (W) and profits (defined as the difference between output and wages); W_o and Y_o are the initial wage bill and income (GDP) level, respectively, $\hat{P}$ is the rate of inflation and w is the rate of increase of the wage bill. If we divide equation (27) by $Y_o e^{\hat{P}t}$ we get

$$\left(\frac{S}{Y}\right)_t = \left(\frac{W_o}{Y_o}\right) e^{wt-\hat{P}t}(s_w - s_r) + s_r. \tag{28}$$

Suppose now that wages do change with prices. In particular, suppose

$$w = w_o + w_1(\hat{P})$$

where w_o is the autonomous rate of change in wages and w_1 is the wage-price coefficient. Then

$$\left(\frac{S}{Y}\right)_t = \left(\frac{W}{Y}_o\right)e^{\hat{P}(w_1-1)t+w_o t}(s_w-s_r)+s_r \tag{29}$$

Following Thirlwall we differentiate equation (29) with respect to $\hat{P}$ to get:

$$\frac{\partial(S/Y)_t}{\partial \hat{P}} = (w_1 - 1)t \left(\frac{W}{Y}_o\right)e^{\hat{P}(w_1-1)t+w_o t}(s_w - s_r) \tag{30}$$

The inflationary financing of business investment in the sense we have been discussing implicitly assumes that $\partial(S/Y)_t/\partial\hat{P}>0$. This, as will be seen from equation (30), happens only if (1) $w_1<1$ and (2) $s_w<s_r$, i.e., income redistribution occurs between wage earners and profit earners and the marginal propensity to save (and invest) of the profit earners (who gain real income) is greater than the marginal propensity to save of the wage earners (who lose real income).

In the view of this author, the assumption that $s_w<s_r$ could be accepted more easily than the assumption of $w_1<1$. In general, one may hypothesize that w_1 would tend to approach unity as $\hat{P}$ increases. In short, at very low (and non-chronic) rates of inflation, the effects of inflationary financing of business investment could be favorable to growth since wage earners may behave as if the rate of inflation will be constant. But as inflation rates increase, the saving ratio, and hence real GDP growth, is not likely to be increased by inflation, since w_1 becomes virtually unity.

In terms of von Furstenberg's analysis, the foregoing argument would take the following form. The bank financing of business enterprise leads to a rise in the market value of ownership claims in respect of physical assets relative to the replacement cost of those assets, i.e., q would rise. This, in turn, lowers the real rate of interest, raises desired wealth of the private sector and, given s_k, increases the desired capital stock of businesses and households. The end result is increased growth. But the rise in inflation, if it continues, eventually tends to increase uncertainty, thereby reducing q and reversing the process just outlined.

Apart from the view that beyond modest rates such inflationary financing could not be used effectively to redistribute real income from wage earners to profit earners, the quality of investment in the private sector is expected to deteriorate as the rate of inflation increases so that the

rate of return to investment, and hence real GDP growth, would be adversely affected. 1/

V. Empirical Aspects

Before presenting some more recent empirical findings relating to the cross-section data we shall briefly present the conclusions of other authors who have looked at the international evidence relating inflation and growth.

The general evidence

At least since the late fifties attempts have been made to examine the international data to see if differences in GDP growth rates or their changes have had any association with differences in inflation rates or their changes. Tun Wai (1959) in a study of 31 countries covering years during the period 1938-54 found that for less-developed countries the data was inconclusive; but for most of a small number of countries for which available statistics cover periods in which the rates of price increase differed significantly, the evidence indicated that the rate of growth was higher when the rate of inflation was lower. It is interesting to note that the countries for which the intracountry study could be done were primarily countries with relatively high average inflation rates (and in Latin America).

Dorrance (1966) studied 48 countries, also both developing and industrial, covering the years 1953-61, and found that his data supported the argument for mild inflation except for the low-income countries. In particular, declining prices or "unduly low price increases" tended to be associated with low rates of growth. However, once inflation exceeded some level, rising prices tended "to discourage economic development."

Wallich, studying 43 countries (18 industrial and 25 developing), using five-year averages covering the 10-year period 1956-65 found that (current) inflation was significantly negatively related to growth. He concluded: "[the] size of the coefficients indicates that only the smaller part of the effect of inflation operates via the effect of inflation on investment. The larger part operates through other channels--which may include factors such as the quality, distribution, and cost of investment."

1/ For a general analysis of these and related issues in the cost of inflation see, for example, Bailey (1956), Dorrance (1963), Fischer and Modigliani (1978), as well as Kessel and Alchian (1962).

Thirlwall and Barton (1971) in a study of 51 countries over the 1958-67 period, 17 of which had per capita incomes in excess of $800 per annum in 1963, and the rest below that, concluded that in general "the protagonists of mild inflation have the evidence on their side." For countries with per capita incomes exceeding $800 there was a clear positive association between inflation and growth. In the group below $800 per annum no significant relation between growth and inflation emerged. But when they divided the latter group into two subgroups--those with inflation of less than 10 per cent per annum and those above 10 per cent--they found that for countries with less than 10 per cent inflation no particular relation was discernible while for the countries with inflation in excess of 10 percent a significant negative association was discernible. They concluded: "It would appear that once the rate of inflation exceeds 10 percent per annum the negative aspects of the effects of inflation on growth tend to come to the fore." In a later study Thirlwall (1974) also found that in a cross-section of 15 countries in Latin America covering the period 1958-68 there was evidence of "a definite negative relation between inflation and growth in Latin America." But he cautions against jumping to the conclusion that the Latin American experience provides evidence that inflation is detrimental to growth given the very high inflation rates experienced by many of the countries concerned; evidently there is no dispute that after a point inflation is detrimental to growth.

An IMF staff study of 112 "non-oil" developing countries over the 1969-1981 period concluded that for the most part "relatively low inflation rates have been associated with relatively high growth rates and that reductions, or at least relative reductions, in inflation have been associated with an improvement, or relative improvement, in growth rates." 1/

Empirical testing of structuralism per se has tended to be directed mainly at the issue of the role of structuralist factors versus monetarist or excess aggregate demand factors in explaining inflation in Latin America.

1/ Although it has not featured prominently in the growth-inflation literature of the developing countries, it is relevant to mention the natural rate hypothesis, which no doubt can be utilized with possible beneficial results to analyze the output-inflation tradeoffs in developing countries. The natural rate hypothesis posits that changes in inflation will stimulate changes in real output if and only if such changes succeed in getting suppliers of factor services and of commodities to believe that relative prices are moving in their favor in line with inflation. Lucas, for instance, has shown that the larger the variance of inflation the smaller will be the increase in output accompanying a given percentage increase in inflation within any given time period. In other words, the greater the variance of inflation, the less likely it is that decision-makers will be deceived into believing that changes in general price movements constitute relative price changes.

In terms of our analysis in this paper a recent work of special interest is that of Wachter. Using data for Chile, Brazil, Mexico and Argentina she found support for the view that, using quarterly data, inflation was positively correlated with the percentage change in the relative price of food--the latter defined as the price of the food component of the consumer price index (CPI) divided by the total CPI; in these equations changes in the stock of money (lagged and unlagged) were also important parameters explaining inflation. Thus an important structuralist hypothesis was generally supported while not completely negating "monetarist" claims. But the results were not favorable for the structuralist variable when annual data were used. Wachter argues that one could not expect the structuralist variable (P* in our model) to be significant in the long run, whether assuming a passive or an active money supply, even if it is significant in the short run. Assuming money supply is passive (and she does find evidence of this using Sim's test of causality), a higher P* which induces a higher inflation rate will "cause" the money stock to increase. And, she explains, given inflationary expectations and the level of real income, the rate of monetary expansion will then fully mirror any changes in the inflation rate. Even if the money supply is not passive, she argues, in conformity with general monetary theory, that if the inflation rate varies with P* in the short run it will not in the long run, due to the real balance effect. That is, in the long run the money stock will expand in response to higher prices so that the impact of P* on the general price level will no longer be perceptible; alternatively, absolute prices will return to their initial level despite a higher P* if the money stock remains unchanged. Her point is that if prices respond quickly to the real balance effect and/or if the money stock responds quickly enough to inflation, the "long-run" effects may come within a year. For instance, using Almon lags, she finds that the bulk of the response of prices to changes in the money stock in Chile occurs within the year.

Empirical implications of the models

The models discussed in Sections II-IV can be interpreted as stating the conditions under which changes in inflation and changes in growth will be positively correlated. Or they may be interpreted as stating that changes in inflation and changes in growth will be positively correlated because of certain conditions which tend to exist at least in some developing countries.

In the case of structuralism the empirical arguments are (1) that increases in growth lead to increases in the relative price of the agricultural good and (2) that, due to price rigidity in the industrial sector, increases in inflation will tend to accompany increases in the relative price of the agricultural good. These lead to the conclusion that increases in growth must be accompanied by increases in inflation for

the set of developing countries for which the hypothesis holds. In short, remembering that P_A is the price of the agricultural good, P_I the price of the industrial good and $P^* = P_A/P_I$, structuralism implies that

$$\frac{\partial \hat{P}}{\partial \hat{y}} = \frac{\partial \hat{P}^*}{\partial \hat{y}} \cdot \frac{\partial \hat{P}}{\partial \hat{P}^*} > 0. \qquad (31)$$

Both the inflation tax and inflationary finance of business investment arguments require (1) that the investment/GDP ratio increase with inflation and (2) that growth increase with the investment/GDP ratio. If these hold, then there will be a positive correlation between changes in inflation and changes in growth. In the case of the inflation tax it must be true empirically (i) that the ratio of government expenditure to GDP increases with inflation (i.e., $\partial(\hat{G_E/Y})/\partial\hat{P} > 0$); (ii) that government capital expenditure increases relative to total government expenditure when the latter increases relative to GDP (i.e., $\partial(\hat{GKT})/(\partial\hat{G_E/Y}) > 0$); (iii) that government investment does not crowd out private investment, so that the investment/GDP ratio increases with the ratio of government capital expenditure (i.e., $\partial(\hat{I/Y})/\partial\hat{GKT} > 0$); and (iv) that the productivity of government expenditure is such that growth can be increased by increasing government investment relative to government total expenditure (i.e., $\partial y/\partial(\hat{GKT}) > 0$). In short we have for the case of inflation tax to finance government investment that:

$$\frac{\partial \hat{y}}{\partial \hat{P}} = \frac{\partial(\hat{G_E/Y})}{\partial \hat{P}} \cdot \frac{\partial(\hat{GKT})}{\partial(\hat{G_E/Y})} \cdot \frac{\partial(\hat{I/Y})}{\partial(\hat{GKT})} \cdot \frac{\partial \hat{y}}{\partial(\hat{I/Y})} > 0. \qquad (32)$$

For the inflationary finance of business investment to generate increased investment relative to GDP private saving must increase relative to GDP. For this to happen, as we have been shown, it must be empirically true that (1) increased inflation results in a transfer of income from wages to profits and (2) the propensity to save out of the income of profit earners is greater than that of wage earners. If these hold then the investment/GDP ratio (I/Y) will increase with inflation. In short,

$$\frac{\partial \hat{y}}{\partial \hat{P}} = \frac{\partial(\hat{I/Y})}{\partial \hat{P}} \cdot \frac{\partial \hat{y}}{\partial(\hat{I/Y})} > 0. \qquad (33)$$

Strictly speaking the above empirical implications assume only a closed economy. Once an open economy is considered, an additional restriction implicit in the above approaches is that the change in inflation must not lead to an appreciation of the real effective exchange rate (RER) with negative output effects large enough to dominate any positive relation that would otherwise exist between inflation and growth. That is, it would be especially valuable if it is the case that $\partial(RER)/\partial P \leq 0$.

The question arises as to whether the nature of the relationship between inflation and growth remains invariant, irrespective of whether the average rate of inflation over an extended period of time is low, medium or high. It is only fair to say that many (see e.g., Dorrance, Thirlwall) who have argued that there is a positive correlation between changes in inflation and changes in growth state explicitly that the positive relation holds only up to a certain rate of inflation. In short, the hypothesis is that up to a certain level of inflation, increases in growth will be positively correlated with increases in inflation. That is, the relation between inflation and growth will take the following form:

$$\frac{\partial \hat{y}}{\partial \hat{P}} = a - b\hat{P} \qquad (34)$$

where a and b are constants. This simple differential equation then implies

$$\hat{y} = \alpha + \beta\hat{P} - \gamma\hat{P}^2 \qquad (35)$$

where α, β and γ are constants.

In the form of equations (34) and (35) the hypothesis is not inconsistent with the view that, on average, low-inflation countries will tend to have higher rates of economic growth than high-inflation countries in the developing world. Up to a point, increases in inflation will be accompanied by increases in growth but the latter will be declining for marginal increases in inflation. Indeed, at the point at which the marginal gain in growth from inflation becomes zero, $\hat{P}$ will be equal to a/b in equation (34), or $\beta/2\gamma$ in equation (35).

Some additional empirical results

Using pooled cross-country annual data, for 86 countries, covering the years 1974-83, 1/ the reduced-form relation between changes in growth and changes in inflation has been examined. Included were dummy variables for the countries, with the dummies entered in a way that assumed that the country-specific factors affect the intercept and not the slope of the growth-inflation equation. The constant term was also suppressed. The result obtained (by ordinary least squares regression) was the following:

$$\Delta \text{Ln } y = \beta_0 - \underset{(-3.7912)}{0.07366}\ \Delta \text{Ln } P^{**} \qquad (36)$$

$$\bar{R}^2 = 0.21 \qquad \text{SEE} = 0.07$$

1/ This yielded 860 observations.

In equation (36) y is real GDP, P is the consumer price index, and Ln is the natural logarithm. The number in parenthesis is the t ratio and double stars (**) indicate that ΔLn P is significant at the 0.01 level. The parameter β_0 has been added to equation (36) to reflect the presence of the dummies. As can be seen from equation (36) the results for the sample as a whole rejects the hypothesis of a positive relation running from changes in inflation to changes in growth; instead a negative relation is supported by the sample as whole.

The structuralists have emphasized the relationship running from growth to inflation. The empirical results from the pooled time-series cross-section data also rejects the hypothesis that the relationship was positive for the 86 countries during the 1974-83 period. The result obtained was as follows:

$$\Delta \text{Ln } P = \beta_0' - \underset{(-3.79124)}{0.24782}\Delta \text{Lny}^{**} \qquad (37)$$

$$\bar{R}^2 = 0.75 \qquad \text{SEE} = 0.13$$

The values in parenthesis are t values, while the double stars (**) indicate significance at the 0.01 level. As before, the constant term was suppressed in the equation, dummies were included for all countries.

On examination of the data the conclusion of this author is that the basic reasons for the negative correlation were that, on average, for the 86 countries as a whole, during the period, (1) the rate of change in the ratio of government expenditure to GDP tended to decline with increases in inflation; and (2) the real effective exchange rate tended to increase its rate of appreciation or decrease its rate of depreciation with increases in inflation.

The quality of the data makes it difficult to make definite statements about the reasons for the negative relation between growth and inflation during the 1974-83 period. Nevertheless, correlation analysis, presented in Table 1 below, revealed a negative correlation between inflation and changes in the G_E/Y ratio but a positive correlation between inflation and the rate of appreciation of the real effective exchange rate. Two stars (**) indicate significance at the 0.01 level. Note that the number of countries depends on the availability of data.

Table 1. Correlation Results for Inflation, Government Expenditure and Real Effective Exchange Rate

Variables Correlated	Number of Countries	Period	Number of Observations	Correlation Coefficient
1. ΔLnP and ΔLn(G_E/Y)	73	1974-83	730	-0.1437**
2. ΔLnP and ΔLn(RER)	86	1974-83	860	0.0968**

The negative correlation between inflation and changes in G_E/Y as well as the positive correlation between inflation and changes in the real effective exchange rate, both contributed to the negative correlation between inflation and (real GDP) growth. In the case of the real effective exchange rate it worked mainly through a reduction in the investment ratio; it is noteworthy that, in fact, once the effect of the real effective exchange rate on investment had been accounted for, inflation did not, on the whole, harm investment. Equation (38) gives the relation between changes in the investment/GDP ratio and changes in the price level and the real effective exchange rate RER for the 32 countries (out of 86) for which the relevant data were available, covering the years 1974-82:

$$\underset{}{\text{Ln}(I/Y) = \beta_0} \underset{(2.47774)}{+ 0.05326\text{LnP}^*} \underset{(-6.24174)}{- 0.52932\text{Ln RER}^{**}} \qquad (38)$$

$$\bar{R}^2 = 0.99 \qquad \text{SEE} = 0.17$$

The high value of the $\bar{R}^2$ reflects the significance, at 0.01 level of all the country dummies.

In equation (39) the relation between government expenditure-GDP ratio and output is also shown as being significantly positive. Again the high value of the $\bar{R}^2$ reflects the significance of the country dummies. The relation obtained was as follows:

$$\underset{}{\text{Ln } y = \beta_0} \underset{(3.24319)}{+ 0.08016\text{Ln}(G_E/Y)^{**}} \qquad (39)$$

$$\bar{R}^2 = 0.99 \qquad \text{SEE} = 0.13$$

Due to lack of sufficient data, it is not possible to make any conjecture about whether or not the relative price of agriculture increased with growth and/or whether or not increases in the relative price of agriculture resulted in increases in inflation for the 86 countries, on average, during the period.

In order to test the hypothesis that the relationship between inflation and growth changed with the average level of inflation, the sample of 86 countries was divided into three subsamples: low-inflation countries, medium-inflation countries and high-inflation countries. The first subsample comprised 30 countries, each with an average inflation rate during 1974-83 of less than 11 percent, the second (medium-inflation countries) comprised 35 countries with average 1974-83 inflation rates of 11-20 percent, while the third subsample (high-inflation countries) comprised 21 countries with average inflation rates during 1974-83 greater than 20 percent. 1/

For the low-inflation countries (denoted by subscript L) the following relations were obtained:

$$\Delta Lny_L = \beta_{0L} + \underset{(0.2795)}{0.01581}\ \Delta LnP_L \qquad (40)$$

$$\bar{R}^2 = 0.24 \qquad SEE = 0.07$$

$$\Delta LnP_L = \beta'_{0L} + \underset{(0.2795)}{0.01837}\ \Delta Lny_L \qquad (41)$$

$$\bar{R}^2 = 0.51 \qquad SEE = 0.08$$

Both ΔLnP_L in equation (40) and ΔLny_L in equation (41) were not significant at even the 0.10 level. Thus, although the coefficient

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1/ For the subgroups, the unweighted means and average variances of inflation rates during 1974-83 were as follows:

	Mean	Variance
Low inflation	8.2	71.8
Medium inflation	14.2	70.9
High inflation	51.7	3096.5

relating changes in growth with changes in inflation had a positive sign in both equations, it was not significantly different from zero.

For the medium-inflation countries (denoted by subscript M) the following relations were obtained:

$$\Delta Lny_M = \beta_{OM} - \underset{(-3.6061)}{0.1497\Delta LnP_M^{**}} \qquad (42)$$

$$\bar{R}^2 = 0.36 \qquad SEE = 0.05$$

$$\Delta LnP_M = \beta'_{OM} - \underset{(-3.6061)}{0.2656\,\Delta Lny_M^{**}} \qquad (43)$$

$$\bar{R}^2 = 0.78 \qquad SEE = 0.07$$

As can be seen, the inflation and growth variables of equations (42) and (43) were both significant at the 0.01 level. It is clear from equations (42) and (43) that, unlike the case of the low-inflation countries, the relationship between growth and inflation for the medium-inflation countries was not only highly significant but was also a negative one.

For the high-inflation countries (denoted by subscript H) the following results were obtained:

$$\Delta Lny_H = \beta_{OH} - \underset{(-2.6213)}{0.0759\Delta LnP_H^{**}} \qquad (44)$$

$$\bar{R}^2 = 0.06 \qquad SEE = 0.09$$

$$\Delta LnP_H = \beta'_{OH} - \underset{(-2.6213)}{0.4645\Delta Lny^{**}} \qquad (45)$$

$$\bar{R}^2 = 0.76 \qquad SEE = 0.23$$

Again, as in the case of the medium-inflation countries, the relationship between growth and inflation was significant but negative.

These empirical results lend support to the conclusion that, given the levels of world inflation prevailing during the period 1974-83, once domestic rates of inflation tended on average to be maintained above 10 percent, increases in inflation tended to be harmful to (real GDP) growth. In short, the evidence indicates that it is not unlikely that equation (34) was valid empirically during 1974-83, but that even if this was so then a/b, the rate above which increases in inflation tend to be associated with decreases in growth, was probably no more than about 10 percent. It was probably the case that for countries which during

this period maintained average inflation rates not exceeding 10 percent, small increases in inflation (1) tended to reflect imported inflation, (2) were not politically difficult to neutralize by nominal exchange rate changes, and (3) did not hurt (and probably helped) investment because such inflation did not change expectations by private decision-makers of continued low average rate of inflation.

The evidence also seems to indicate that the negative correlation between changes in inflation and changes in growth in the same year was more marked for the medium-inflation countries than for the high-inflation countries. This could reflect greater uncertainty regarding the future course of inflation in medium-inflation countries and/or a much more complete adaptation to the generally prevailing level of inflation in the high-inflation countries. This would tend to be the case especially if the high-inflation countries of the 1970s had experienced high average rates of inflation for an extended period of time.

VI. Concluding Remarks

This paper has been concerned with the nature of the economic arguments relating inflation and growth as they have been generally advanced in the development literature. In structuralism the presumption is that the change in the relative price of "the" agricultural commodity increases with growth and that this in turn induces increase in the rate of inflation. For the case of inflation tax as an instrument for financing government investment, the implicit assumptions are that increases in inflation are beneficial to raising government expenditure relative to GDP, that government capital expenditure rises relative to total government expenditure when the latter rises relative to GDP, and that increases in government capital expenditure relative to total expenditure raise domestic investment relative to GDP engendering increases in (real GDP) growth. Any positive relation between changes in inflation and changes in growth ensuing from these factors will tend to be augmented if the real effective exchange rate does not increase in appreciation with increases in the inflation rate. The analysis involving inflationary finance of business investment assumes implicitly that the investment-income ratio increases with inflation, which in turn entails the dual condition that the wage-price coefficient relating change in money wage to change in prices be less than unity and that the marginal propensity to save of wage earners be less than that of profit earners.

The findings of past empirical work on the subject was reviewed. It was seen that in general such work has concluded that the cross-country data have been consistent with the view that low-inflation countries tend to perform better than high-inflation countries as far as (real GDP)

growth was concerned; but some of that literature has also produced evidence showing that up to a certain relatively low level of inflation, increases in inflation tend to be positively correlated with increases in growth. It was also seen that there was some evidence supporting the basic structuralist thesis only in the very short run.

Empirical investigation of the theories under discussion should in principle involve two steps. The first would look at the overall relation between inflation and growth while the second would investigate which of the preconditions (or implicit assumptions) were satisfied and which were not. Some new test results were provided in the paper using pooled cross-section time-series data for 86 developing countries covering the period 1974-83. It was found that for the group of countries as a whole, during the period studied, a change in the rate of inflation was negatively correlated with change in the rate of real GDP growth. In particular, it was found that, on average, over the period 1974-83, a 1 percentage point increase in the inflation rate was associated, ceteris paribus, with an 0.074 percentage point decrease in the growth rate. Division of the sample into low-, medium- and high-inflation countries revealed no significant relation between changes in inflation and changes in growth for the low inflation countries, but a negative relation for the medium- as well as the high-inflation countries. Examination of the data lent support to the conclusion that the explanation of the negative relation was to be found primarily in the negative relation between changes in the government expenditure/GDP ratio and inflation, and the increasing appreciation of the real effective exchange rate as inflation increased. It cannot be overemphasized that the quality of the data renders this conclusion highly tentative.

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