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Indirect Taxation and the Control of Inflation in a Developing Economy

Prepared by Parthasarathi Shome 1/

Approved by Ved P. Gandhi

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Contents

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Contents

Abstract

Quite a few attempts were made in the 1970s, addressing the issue of the effect of taxation on inflation, concluding that taxes were not a powerful instrument in controlling inflation and that, indeed, indirect taxes might increase inflation through cost-push effects. This paper re-examines how indirect taxation affects inflation by allowing for dual effects: an increase in the tax rate fans cost-push inflation, but also slows it by reducing the government deficit, the final outcome being the net effect of the two influences. This approach is often realistic for Fund mission work. In the face of an excessive government deficit, tax increases are inevitably recommended, while it is assumed that demand management would accompany such tax increases.

The model has six sectors with a specification of their price-cost equations, and includes an interconnection of sectoral prices to the general price level and vice versa. While earlier studies have usually addressed developed country scenarios, this model relates to a small, open developing economy, by allowing for dual exchange rates as well as a dependence of domestic on international prices.

Simulations are made under stipulated element values such as shares of value added, exports and imports in the production of each sector. The results call into question the conventional wisdom regarding the relationship between indirect taxes and inflation. They depend upon the initial values of price parameters such as exchange rates, wage rates, or international prices. It is found that increases in indirect tax rates lead to lower inflation rates. However, the overall effect is less than impressive and, as inflation increases, the effectiveness of tax policy in combating that inflation decreases.

I. Introduction

> ...fiscal policy measures may have...cost-inflationary effects that should be considered when discussing the optimal policy mix...an increase in indirect consumer taxation, imposed to diminish consumer demand and thus inflation, will tend to have cost-inflationary effects that might not have arisen had the same demand curb been accomplished by other means. What is gained on the demand side may thus be lost on the cost side. (Hansen, 1971, p. 446).

> Under the normal assumption of forward shifting, increases in indirect taxes (including those on imports) are likely to have an immediate effect on the cost of living index. Whether that initial effect is followed at a later stage by further increases or by declines in the prices of nontaxed products or of productive factors depends on a variety of factors....(An) increase in excise taxes...will reduce the consumers' real income by raising the price of the taxed products...(and) the output of the taxed products will decline. Therefore, even if the money supply has not changed, in the short run the same amount of money will be used to purchase fewer goods, with the implication that the price index will rise....(An) increase in a general sales tax...is clearly inflationary, as the tax increase is likely to be shifted forward in higher prices....The basic conclusion to be derived from this short discussion of increases in indirect taxes is that their usefulness in bringing about price stabilization is limited. (Tanzi, 1983 a, p. 414).

This paper re-examines the effect of increases in indirect taxes on cost-push inflation. In the context of developed countries, quite a few attempts were made in the 1970s to address the issue of the effect of taxation on inflation, for example, by Artis (1971), Wilson (1972), Auld (1974), Pitchford and Turnovsky (1975), and Brechling and Classen Utgoff (1979). These studies generally concluded that taxes are not a powerful instrument in controlling inflation and that, indeed, they may increase inflation through cost-push effects. This is especially true for indirect taxes. But if one allows for dual effects of taxation, by postulating that any increase in the tax rate--for example, in an indirect tax in the manufacturing sector--fans cost-push inflation, but also slows it by reducing the government deficit, the final outcome would be the net effect of the two influences. Such a two-pronged treatment of indirect taxation is attempted in this paper. This approach is often realistic for Fund mission work. In the face of an excessive government deficit, tax increases are inevitably recommended, while it is assumed that demand management would accompany such tax increases.

A simple specification is used to demonstrate the net impact of the dual effects of indirect taxation. It consists of multisectoral price-cost equations that connect sectoral prices with the general price level and vice versa. The model reflects small, open developing economies, rather than the developed country scenarios of earlier papers, in that it allows for dual exchange rates as well as the dependence of domestic on international prices. 1/ It is assumed that traditional exports and imports of capital take place at an official exchange rate at par with the U.S. dollar, while imports and exports of other goods occur at a parallel market exchange rate. The smallness of the economy is expressed through the dependence of import and export prices, and therefore of domestic prices in general, on international prices. This reflects the actual experience of many developing countries of a marked exposure to fluctuations in the international prices of a few traditional exports as well as a considerable inflexibility in interest rates and exchange rates. The existence of pegged or managed floating exchange rates and the application of more than one exchange rate to different transactions, apart from quantitative controls and quotas, is documented in IMF (1984). 2/ In such a scenario, the issue addressed is the ability of tax policy in controlling inflation from the cost side.

There are certain limitations in this framework, however. First, the role of monetary policy is not explicit although the relationship between government deficit and prices is implicit in the basic framework of the quantity theory of money. It cannot be denied, however, that interest rate policy in many developing countries is heavily controlled. To quote a recent study by the IMF (1983):

1/ The basic framework, without a government sector or a role for taxes, was developed by members of a recent Fund mission to a small, open Central American country in which this author participated. The model specification and the values of economic elements (Table 1) could, therefore, be interpreted as broadly representing that economy at the time. However, the tax element is entirely hypothetical and should be interpreted as a general investigation of one aspect of the effects of tax policy on inflation in a representative small, open developing economy.

2/ Refer pp. 4-7 for a description of current exchange rate arrangements and pp. 37-40 for one on multiple currency practices. Also see Table 1, p. 8, for a breakdown of actual exchange rate arrangements on March 31, 1984 in Fund member countries. Thirty-three countries are pegged to the U.S. dollar, 13 to the French franc, 5 to other currencies, 11 to the SDR, and 28 to other composites. In 9 countries, flexibility is limited against a single currency and in 8 (developed countries) it is limited against a group of currencies through cooperative arrangements. In 6 countries it is adjusted according to a set of indicators, in 24 there is "managed" floating with ceiling and floor rates, and only in 7 developed countries and Uruguay is there an independently floating mechanism.

> There is widespread reluctance among...developing countries to permit interest rates to be determined in the market. This reluctance...(to) a great extent...may derive from the view that interest rates ought to serve various policy objectives rather than bringing the underlying demand for funds into equilibrium with their supply. For this reason, there has been a tendency for the administered interest rates...to be lower than current rates of inflation. (p.19).

Other studies, by, for example, Peacock and Williamson (1967) and Pitchford and Turnovsky (1975), have also studied the effects of taxes in an inflationary context by suppressing the monetary sector. 1/ Essentially, their models use the wage-price mechanism of the classical approach which is also used in this paper.

Second, this paper assumes that demand management will be implemented with the increase in taxes. This might call for stable government expenditures as taxes increase. In conventional macro models (see particularly Tobin and Buiter (1976)), government expenditure is treated as exogenous and the resulting deficit as endogenous. The assumption of stable expenditure has also been made in earlier studies, specifically in analyses of taxes and inflation by, for example, Brennan and Auld (1968) and Wilson (1972). 2/ Further, it must be noted that if the assumption were made that tax increases would increase government expenditures, the conclusion about the limited role of tax policy in controlling inflation would be strengthened.

Third, the paper focuses on indirect taxation. At least two supporting arguments are relevant. First, in developing countries, indirect taxes are usually more important than direct taxes (Tanzi, 1983 b, Tables 1 to 4), so the effect of an indirect tax on inflation should

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1/ To quote Pitchford and Turnovsky (1975): "Much of the inflationary process operates through the monetary sector and this aspect is not adequately specified in our model. Furthermore, we abstract from the effects of supply on prices by holding output constant at the full employment level." (p. 282).

2/ To quote Brennan and Auld (1968): "The model...has been chosen essentially for its simplicity. It does not purport to be highly realistic. Nor is it claimed to be a complete representation of the inflationary process. But it is intended to represent a fairly significant component of inflationary situations in which the rate of change in prices is fairly small, and where there is little evidence for the existence of substantial excess demand in the economy. To render the model more acceptable, it is assumed that the level of demand is maintained...." (pp. 521-22).

To quote Wilson (1972): "I am prepared to assume that, at given levels of demand, indirect taxes are typically shifted forward to buyers, thereby adding cost pressure to prices...." (p. 179).

be more important than that of a direct tax. Second, authors have in general been more concerned with the inflationary impact of indirect taxes since that is believed to be stronger than that of direct taxes. To quote Peacock and Williamson (1967), for example,

> ...in any significant sense, consumption taxes are more inflationary than income taxes.... (p. 44).

It is, therefore, of greater interest to test the effect of indirect taxes on inflation. In what follows, Section II presents the framework and Section III the results. Section IV summarizes the main findings in the form of some concluding remarks.

II. The Framework

The framework used in this paper belongs to the broad class of models depicting the effect of policy instruments on economic targets, sometimes simultaneously in the internal and external sectors of the economy, based on the general theory of economic policy developed by Tinbergen (1952), Hansen (1958), and Theil (1964) to name a few. 1/

The theory of economic policy has been advanced in recent years through the works of Dornbusch (1976), Kouri (1976), Dornbusch and Fischer (1980), Frenkel, Gylfason, and Helliwell (1980), Gylfason and Helliwell (1983), and others. All of these analyses, however, assume flexibility in economic instruments and vary primarily in their assumptions about expectations and foresight in the context of the theory of rational expectations or in the feedback mechanisms specified within the economy. Many developing countries, however, strictly administer variables that are allowed to float freely in the developed country models. Prices of essential commodities as well as protected industrial products are, for example, often subject to administrative control. The exchange rate is fixed--usually at an overvalued level for the domestic currency--at single, dual, or multiple rates for individual components of the current and capital accounts of the balance of payments. Similarly, the rate of interest is often fixed--at a lower than equilibrium level--at different levels for different sectors of the economy. So the usefulness of modern advances in the theory of economic policy--such as the overshooting perfect foresight model or the port-

1/ Some models based on this theory, such as Swan's (1955), cautioned against the long-run stability problems of equilibria while others, such as Mundell's (1960, 1962) theory of effective market classification, pointed toward the possibility of creating and then matching policy variables with specific targets to achieve stable economic equilibria. Others, such as McKinnon and Oates (1966), Cooper (1970), and Marris (1970), later looked at the role of fixity and flexibility in exchange rates in the generation of internal and external equilibria.

folio adjustment model--become somewhat academic where the possibilities of adjustments in the exchange rate, the rate of interest, and other prices, on which these theories are primarily based, are negligible. 1/

When other instruments are not flexible, the focus for policy invariably shifts to fiscal policy in general, and tax policy in particular, since the government's budget, it is assumed, can substitute for rigidities elsewhere. The specification in this paper is therefore a simple variation of the early approaches enunciated by Tinbergen (1952) and Hansen (1958). In this framework we can easily define policy instruments, vary them, or fix them, depending on assumptions about policymaking, and study their effects on the relevant variables.

A stylized economy with six sectors is used--primary, manufacturing, electricity, transport, government, and other--and sectoral equations are specified for price changes, the underlying assumption being that the sectoral production functions are linearly homogeneous (see the Appendix for the derivation of the price changes from a production function). Since the issue to be addressed is the inflationary impact of tax policy changes, the focus is on price variables. The overall price change in the economy is a weighted sum of the sectoral price changes which are functions of wage rates, exchange rates, and tax rates. With administered policy variables such as fixed exchange rates, inflation is influenced by changes in tax policy. Similar experiments can be conducted with changes in more than one policy variable to produce the net impact on inflation, together with tax policy's individual effect. The extent of the required change in the tax rate for an inflation target can, therefore, be obtained.

1. Prices in the economy

Specific assumptions on prices are made for a typical stylized developing country and given below. (All prices are expressed in capital letters, for example, P; changes in prices are referred to with small case letters, for example, p; the domestic currency is units of C.)

1/ Their usefulness in predictions for developing countries has been called into question. To quote van Wijnbergen (1982, p. 133):

> There exists a small but growing body of evidence that the use of some macroeconomic policy instruments...in LDCs has effects that differ from what one would expect given the predictions of the standard 'North-Atlantic' macro-models.

a. Official exchange rate (EO)

The official exchange rate is assumed to be fixed at par with the U.S. dollar and several crucial transactions are assumed to be carried out at this rate, such as imports of petroleum and petroleum products, exports of traditional items (say, sugar, tea, and coffee), and foreign capital receipts and repayments. 1/

b. Parallel exchange rate (EP)

An overvalued official exchange rate (frequently prevalent) is accompanied by a parallel rate which is considerably below the official par with the U.S. dollar. The parallel rate, reflecting the underlying weakness of the currency, can vary widely, depending on capital flight, panic in the exchange market, or speculation. An initial value is assumed of C 1.7 to US$1, and it is further assumed that imports of most consumer items and nontraditional exports take place at this rate.

c. International price (E)

The international price movements of imports and exports will, of course, have an impact on domestic prices, and this is captured in the system of equations.

d. Wage rate (W)

The value added of each sector has a wage component. Any inflationary impact of value added, therefore, reflects the effect of changes in the wage rate on inflation. Price changes in all sectors, therefore, reflect changes in sectoral wages among other influences.

e. Indirect tax rate (T)

The indirect tax rate has a dual effect. It increases prices in the manufacturing sector since producers build taxes into their cost functions, but a given level of government expenditures is less inflationary the higher the tax rate or the lower the deficit. This potential role for tax rates to arrest inflation allows tax policy to be an instrument for moderating the inflationary responses of government exchange rate and incomes policies.

In this model the sixth sector, "other," lumps together the main service sectors--for which the rate of interest would be an important variable--while inflationary effects in the two specified service sectors--petroleum dependent electricity and transport--are determined by exchange rate policy.

1/ Note that the rate of interest does not feature, however. An explanation is provided below.

2. The sectors of the economy

The shares of the sectors in the economy's production are denoted by elements d_i, $i = 1,.....,6$, measured by their respective shares in the value of production. The overall price change in the economy is a sum of price changes in the different sectors, weighted by their respective elements. Thus,

$$p = \sum_{i=1}^{6} d_i p_i \qquad (1)$$

where p is the overall price change in the economy and p_i is the price change in sector i.

The price change equations for individual sectors are expressed as follows:

a. The primary sector, 1

$$p_1 = A_1 x_1 + (1-A_1)\, va_1 \qquad (2)$$

where A_1 is the share of export receipts in primary sector production, x_1 is the export-determined component of the price change p_1, and va_1 is the value added determined component of the price change p_1. In turn,

$$x_1 = a_1 eo + (1-a_1)ep + e \qquad (2a)$$

and

$$va_1 = b_1 w \qquad (2b)$$

Equation (2a) indicates that export-determined price change is the result of changes in (1) the official exchange rate--for that part of agricultural exports, basically traditional exports, which goes at the official rate; (2) the parallel exchange rate--effective for nontraditional exports; and also (3) movements in foreign prices of exports since a positive e will have an inflationary impact at home. Equation (2b) indicates that the inflationary impact of value added is determined by the share of wages in that sector, an assumption made for the other sectors as well, only that in the government sector it is depressed by the tax rate increase, a point we expand upon below.

By substituting equations (2a) and (2b) into (2), we obtain the reduced form equation for sector 1 as:

$$p_1 = A_1 a_1 eo + A_1(1-a_1)ep + A_1 e + (1-A_1)b_1 w \qquad (2)'$$

Given the explanation for the specification for sector 1, the specifications of the other sectors should not need much repetition. Below we present the other sectoral equations with descriptions where necessary.

b. The manufacturing sector, 2

$$p_2 = (1+t)\,\lfloor A_{21}va_2 + A_{22}m_2 + (1-A_{21}-A_{22})p \rfloor \qquad (3)$$

where

$$va_2 = b_2w \qquad (3a)$$

$$m_2 = a_2eo + (1-a_2)ep + e \qquad (3b)$$

Substituting equations (3a) and (3b) into (3), we obtain:

$$p_2 = \frac{(1+t)\,\lfloor A_{22}a_2eo+A_{22}(1-a_2)ep+A_{22}e+A_2C+A_{21}b_2w+A_2d_6p_6 \rfloor}{1-(1+t)A_2d_2} \qquad (3)'$$

where

$$C = d_1p_1 + d_3p_3 + d_4p_4 + d_5p_5$$

and

$$A_2 = 1-A_{21}-A_{22}.$$

Note that equation (3) is specified such that not only are the price movements in this sector determined by changes in its value added va_2 and import prices m_2, but also by p, the price movements in the economy as a whole. As a result, the reduced form equation contains p_i, $i = 1,.....,6$, as well. The appearance of t as a common factor to all ingredients of p_2 implies that it is a production tax on the manufacturing sector, falling equally on both domestic as well as imported inputs of that sector.

c. The electricity sector, 3

$$p_3 = A_3va_3 + (1-A_3)m_3 \qquad (4)$$

where

$$va_3 = b_3w \qquad (4a)$$

$$m_3 = eo + e \qquad (4b)$$

Thus,

$$p_3 = (1-A_3)eo + (1-A_3)e + A_3b_3w \qquad (4)'$$

Note that m_2 in the manufacturing sector is affected both by eo and ep since we assume that manufacturing sector imports come in at both official and parallel market exchange rates. However, m_3 and m_4, of the electricity and transport sectors, respectively, are affected only by eo, since their imports--mainly petroleum--are assumed to come in only at the official rate. Contrarily, it may be observed that the import effect of the "other" sector, m_6, is affected solely by ep, as postulated in equation (7c) below.

d. The transport sector, 4

$$p_4 = A_4 va_4 + (1-A_4)m_4 \tag{5}$$

where

$$va_4 = b_4 w \tag{5a}$$

$$m_4 = eo + e \tag{5b}$$

Thus,

$$p_4 = (1-A_4)eo + (1-A_4)e + A_4 b_4 w \tag{5}'$$

e. The government sector, 5

$$p_5 = A_5 va_5 \tag{6}$$

where

$$va_5 = b_5(w-t) \tag{6a}$$

Thus,

$$p_5 = A_5 b_5 w - A_5 b_5 t \tag{6}'$$

While as in the other sectors, the inflationary impact of value added is primarily determined by wage increases, as in equation (6a), this equation also postulates that the impact is countered by the extent to which such wage increases are financed through indirect taxes. The quantity theory of money, which links money supply and prices, implies that a reduction in the government deficit which decreases the supply of money will deflate the price level. In this framework, even though there is no explicit money equation, it could be similarly argued that an increase in taxes coupled with the assumption that demand management policies reduce the deficit would lower prices.

Note, however, that the specification of the government sector is rather simple. In a more complicated framework, for example, the price of this sector's output could also be made a function of the exchange rate, a possibility which is excluded here. Finer distinctions could

be made, making a particular portion of government output, rather than all of it, bear a price. Instead, wage inflation in the government sector is assumed to be the same as in the rest of the economy such that the effect of higher revenue is entirely on the price of government output.

f. The others, 6

$$p_6 = Bx_6 + (1-B)\lfloor A_{61}va_6+A_{62}m_6+(1-A_{61}-A_{62})p\rfloor \qquad (7)$$

where

$$x_6 = ep + e \qquad (7a)$$

$$va_6 = b_6w \qquad (7b)$$

$$m_6 = ep + e \qquad (7c)$$

Thus,

$$p_6 = \frac{1-(1+t)d_2A_2\lfloor B(ep+e)+(1-B)\{a_{61}b_6w+A_{62}(ep+e)+A_6C\}\rfloor}{1-(1+t)A_2d_2-(1-B)A_6d_6} + \frac{(1+t)(1-B)A_6d_2\lfloor A_{22}\{a_2eo+(1-a_2)ep+e\}+A_2C+A_{21}b_2w\rfloor}{1-(1+t)A_2d_2-(1-B)A_6d_6} \qquad (7)'$$

where

$$A_6 = 1-A_{61}-A_{62}$$

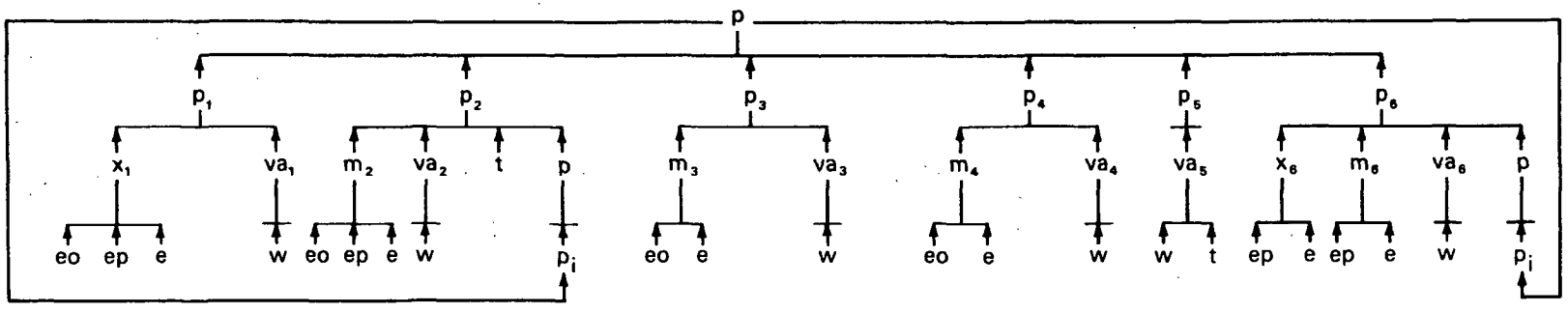
Note that p_6, like p_2, is affected by p, the overall price increase. Hence, we get the terms p_i, i = 1,.....,6, in equation (7)' through the term C. However, the value of p_2, from equation (3)' has already been substituted into equation (7)'. A flow chart tracing the determinants of the change in the economy's price level is presented in Chart 1.

The shares d_i, i = 1,.....,6; A_1, a_1, b_1; A_{21}, A_{22}, a_2, b_2; A_3, b_3; A_4, b_4; A_5, b_5; and B, A_{61}, A_{62}, b_6 in the system of equations are elements which are obtained from information on the economy, a stylized version of which is presented in Table 1. We now have seven unknowns p, and p_i, i = 1,.....,6, and seven reduced form equations (1), (2)', (3)', (4)', (5)', (6)', and (7)'. The effects of changes in the policy variables on inflation in the economy as well as in individual sectors can now be obtained. 1/ In effect, the dual nature of the tax rate, in

1/ In our discussion of results we deal only with the effects of the parameters on p, the overall inflation, for the sake of brevity.

CHART 1

DETERMINANTS OF THE CHANGE IN THE PRICE LEVEL



Sectors i = 1,.....,6

1: *Primary;* 2: *Manufacturing;* 3: *Electricity;* 4: *Transport;* 5: Government; 6: Other

Notations:

p: change in price level
p_i: change in sectoral price level
x_i: export determined component of change in sectoral price level
va_i: value added determined component of change in sectoral price level
m_i: import determined component of change in sectoral price level
t: change in indirect tax rate on manufacturing sector 2
eo: change in official exchange rate
ep: change in parallel exchange rate
e: change in international price level
w: change in wage rate

Table 1. Assumed Values of Elements 1/

Sector 1 Primary		
A_1	Export share	0.50
a_1	Official market share of exports	0.95
b_1	Wage share in value added	0.60
Sector 2 Manufacturing		
A_{21}	Value-added share	0.54
A_{22}	Import share in intermediate goods	0.16
a_2	Official market share in imports	0.33
b_2	Wage share in value added	0.35
Sector 3 Electricity		
A_3	Value-added share	0.30
b_3	Wage share in value added	0.61
Sector 4 Transport		
A_4	Value-added share	0.78
b_4	Wage share in value added	0.70
Sector 5 Government		
A_5	Value-added share	0.47
b_5	Wage share in value added	0.68
Sector 6 Other		
B	Export share of production	0.10
A_{61}	Value-added share of domestic production	0.86
A_{62}	Import share of domestic production	0.01
b_6	Wage share in value added	0.50
Production shares		
d_1	Primary goods	0.15
d_2	Manufactured goods	0.23
d_3	Electricity	0.02
d_4	Transport	0.16
d_5	Government	0.11
d_6	Other	0.33

1/ The element values are a broad representation from a small, open Central American economy.

fanning inflation through the prices of manufacturing but arresting it through the government sector, can be used to test what effect, if any, it has on the control of inflation.

III. The Results

Based on sectoral data in Table 1 and under assumptions of alternative international prices, incomes policies, and exchange rate regimes, simulations were made for the effect of varying tax rates on the economy's inflation rate. 1/ The results, indicating the effectiveness of tax policy given other policy parameters, are presented in Table 2.

Looking at Case A in Table 2 the following observations may be made. Schedule A(i) shows that the elasticity of inflation with respect to the indirect tax rate increases as the tax rate increases. 2/ Thus, doubling the tax rate from 12 percent to 24 percent has a lower percentage impact on inflation than when the tax rate is doubled from 24 percent to 48 percent. This is also obvious from the switch in the slope of Schedule A(i) in Figure 1(a). Note, however, that such drastic increases in the tax rate do not necessarily reduce inflation substantially--from 10.2 percent to 9.4 percent, to 8.5 percent.

Schedule A(ii), reflecting a depreciation of the parallel rate, reveals that while the general direction of the elasticities remains the same as in A(i)--as evident from Figure 1(a)--the difference in the elasticities is now narrowed, as the tax rate is increased. In Figure 1(a) this is expressed through the widening distance between Schedules A(i) and A(ii) as the tax rate increases. This implies from a comparison of A(i) and A(ii) that, as the differential between the official exchange rate and parallel exchange rate increases--from a combination of 1.0 and 1.7, respectively to a combination of 1.0 and 2.0, respectively--the effectiveness of tax policy in addressing the inflation rate diminishes.

Schedule A(iii) reflects the unification of the official and parallel exchange rates at 1.5 and the results are given in Table 2. First, it is clear that the unification leads to higher inflation than in both

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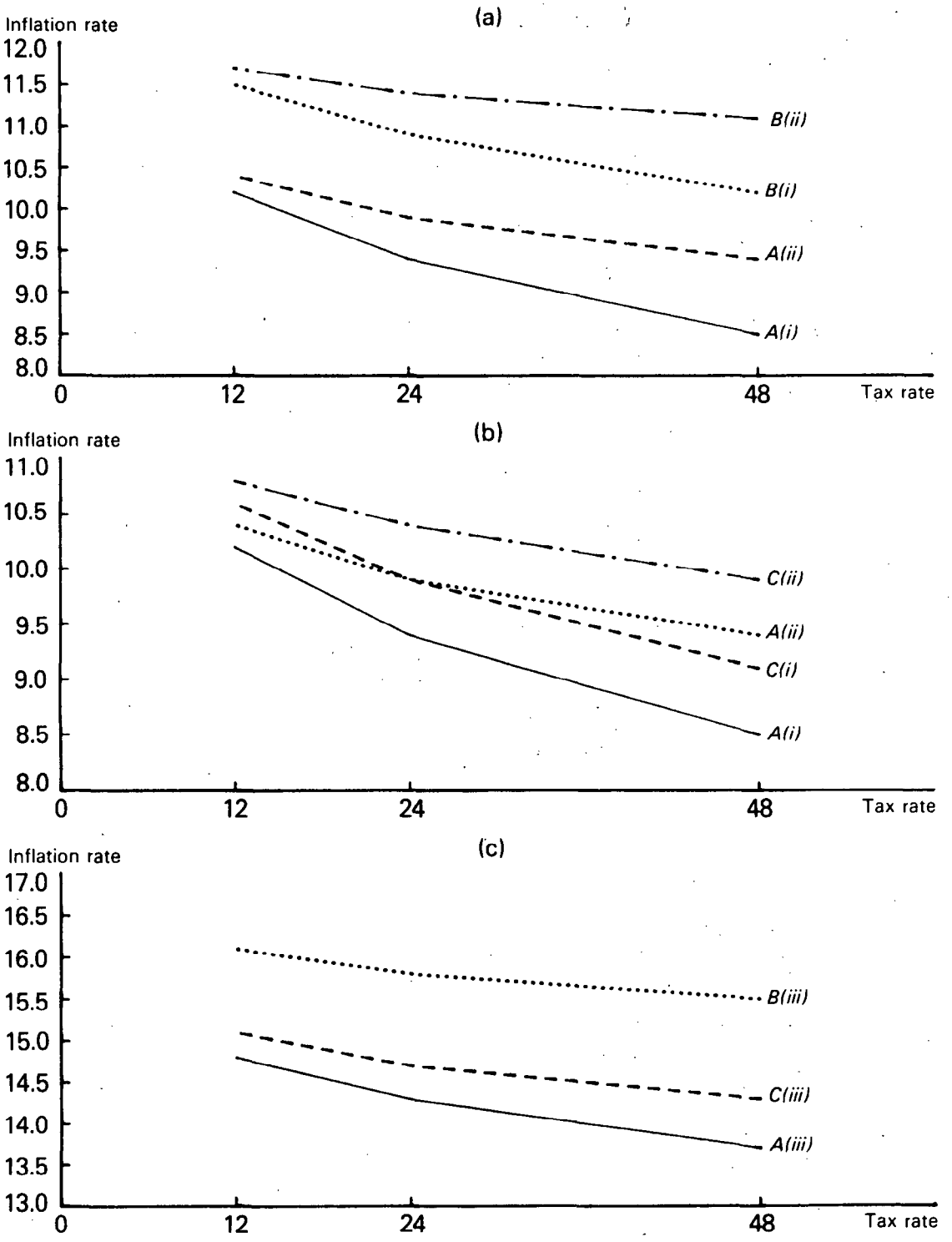
1/ The element values presented in Table 1 will change according to the description of any economy. Our element values reflect the small open economy assumption outlined in Section I with traditional exports and imports of capital at the official exchange rate, and imports of other goods and exports of nontraditional items at the parallel rate. The smallness of the economy is expressed through the dependence of import and export prices, and therefore of domestic prices in general, on international prices.

2/ Recall that our model specification stipulates a proportional tax on the manufacturing sector comprising slightly less than a quarter of overall production. See Table 1.

FIGURE 1

EFFECT OF TAX RATE CHANGES ON INFLATION[1]



[1]The reference on each graph, for example, B(ii), refers to the various combinations presented in Table 2.

Table 2. Effect of Tax Rate Changes on Inflation

	Tax Rate		
	0.48	0.24	0.12
Case A. Wage rate (W): 1.05			
International price (E): 1.07			
(i) Official exchange rate (EO): 1.0			
Parallel exchange rate (EP): 1.7	1.085	1.094	1.102
(ii) EO: 1.0; EP: 2.0	1.094	1.099	1.104
(iii) EO: 1.5; EP: 1.5	1.137	1.143	1.148
Case B. W: 1.10; E: 1.07			
(i) EO: 1.0; EP: 1.7	1.102	1.109	1.115
(ii) EO: 1.0; EP: 2.0	1.111	1.114	1.117
(iii) EO: 1.5; EP: 1.5	1.155	1.158	1.161
Case C. W: 1.05; E: 1.10			
(i) EO: 1.0; EP: 1.7	1.091	1.099	1.106
(ii) EO: 1.0; EP: 2.0	1.099	1.104	1.108
(iii) EO: 1.5; EP: 1.5	1.143	1.147	1.151

Source: Author's calculations.

cases of dual exchange rates. Second, the elasticities are even lower here than in Schedule A(ii) reflecting that a one-shot devaluation may be beneficial for balance of payments problems but that (a) inflation may be stronger than if the parallel market rate was allowed to float downwards--from 1.7 to 2.0--while keeping the official rate at 1.0, and (b) the effectiveness of tax policy in combating that inflation will be further reduced.

Case B alters the wage parameter to 1.10 from 1.05 in Case A; wages are now more inflationary. As expected, the inflation rates in Case B are all higher than in Case A--Schedule B(i) lies above Schedule A(i) and B(ii) above A(ii) in Figure 1(a). While the direction of elasticities remains the same as in Case A--the elasticity of inflation with respect to tax rate increases as the tax rate increases--the elasticities are all lower in Case B than their corresponding values in Case A. For example, the elasticity calculated between tax rates of 12 percent and 24 percent in Schedule B(i) is lower than in Schedule A(i) and similarly for all other possibilities. In Figure 1(a) this is expressed through the smaller slopes of Case B segments in comparison to their corresponding Case A segments. This implies that as inflationary pressures from other sources increase, for example, from incomes policies, the effort required from tax policy, for a uniform effect on inflation, actually rises. 1/

A comparison of Case C with Case A in Table 2 demonstrates the influence of another parameter--international prices--on the effectiveness of tax policy. Increasing the international price parameter from 1.07 in Case A to 1.10 in Case C reveals, as expected, that domestic inflation rates go up under all combinations of exchange rates with tax rates. But the differences in the inflation rates at different tax rates under the same exchange rate regime all fall--for example, as revealed in a comparison of Schedule A(i) with Schedule C(i) in Figure 1(b)--indicating lower inflation elasticities with respect to tax rates for Case C. This implies that the effectiveness of tax policy is reduced when domestic inflationary pressures from international inflation may be highest. Indeed, the same overall conclusions may be drawn from a comparison of Cases C and A in Figure 1(b) as we draw above from a comparison of Cases B and A in Figure 1(a).

Figure 1(c) demonstrates a similar point for the case of a general devaluation. A comparison of Schedules A(iii) and B(iii) shows that the corresponding segments in the latter become flatter than in the former, an observation similar to that from a comparison of A(iii) and C(iii).

1/ Note that in Case B, as in Case A, as the differential between the official exchange rate and parallel exchange rate increases--from a combination of 1.0 and 1.7, respectively, to a combination of 1.0 and 2.0, respectively--the effectiveness of tax policy in addressing the inflation rate diminishes.

This reveals that, if two situations with different initial inflationary pressures are compared, the effectiveness of tax policy in combating such pressures will be lower in the case where the initial pressure is higher.

The main conclusions from this Section may now be summarized as follows:

a. Under a given regime of exchange rates, incomes policy, and international prices, the higher is the tax rate, the lower is the inflation rate. Further, the elasticity of inflation with respect to the tax rate increases as the tax rate increases implying that tax policy is more effective when the initial point is at a higher tax rate as compared to a lower one. However, the overall effect on inflation of each doubling of the tax rate is not impressive.

b. When the initial value of any price parameter such as the official or parallel exchange rate, the wage rate, or the international price is higher, other factors being given, the inflation rate at any tax rate is higher. While the elasticity of inflation with respect to the tax rate still increases as the tax rate increases, the elasticity values are all lower than in the case where the initial value of the price parameter is lower. This implies that the effort of tax policy has to be higher as the initial value of any price parameter increases.

c. When the initial value of any price parameter is higher without any other being lower, the differentials in elasticity values at different tax rates within any regime of parameters narrow, indicating that the effectiveness of tax policy is reduced at a time when initial inflationary pressures from other sources are higher.

d. The effects of a general devaluation under the particular values specified indicates that not only is inflation rate at each tax rate now higher than under the dual exchange rate systems but that corresponding elasticity values are also lower. This implies that a general devaluation to 1.5 from 1.0, compared to a combination of an official exchange rate of 1.0 and a parallel rate of 2.0, will result in higher inflation and that the effort of tax policy in combating the higher inflation will have to be greater.

IV. Concluding Remarks

This paper looks at the effectiveness of indirect taxes given other price parameters such as exchange rates, international prices, and incomes policies in the particular context of addressing inflation. It bases its findings on a simultaneous equations model in price variables descriptive of an open developing economy with dual exchange rates. It concludes that increases in indirect tax rates do imply lower inflation rates, but the overall effect is less than impressive,

and depends on the initial tax rate as well as the initial values of other price parameters such as the exchange rate and the wage rate. It also demonstrates that the effect of tax rate changes on the inflation rate depends critically on the nature of the exchange rate regime.

To elaborate, under any given prices, while the effect of indirect taxes rises with the tax rate, and increasingly so since the elasticity of inflation with respect to taxes also rises with higher tax rates, the overall effect on inflation of each doubling of the tax rate can be small because the elasticity values themselves are small. Also as the initial value of each of the given price parameters--exchange rate, wage rate, international price--is increased, that is, as the initial inflationary pressure from other sources is increased, not only is the effort necessary for indirect taxes in combating inflation greater since the elasticity values fall across the board, but the effectiveness of tax policy is also reduced because the differentials in elasticity values for different tax rates are narrowed.

While these results are not in significant variance with the general position in the literature that indirect taxes can be inflationary and are, at best, uncertain in their effects, they do establish that indirect taxes could be anti-inflationary at the margin, however small this effect may be, as long as tax increases are accompanied by restrictive government expenditure policies. These results are even stronger than in Tait (1981) where he found, in a sample of developed and developing countries, that "the introduction of VAT [value-added tax]had a major impact on inflation in only 4 of the 31 countries under review." (p. 38). He thus concluded, "Clearly it is possible to introduce a VAT (sometimes even to increase revenues) without shifting, or increasing the rate of change of prices." (p. 42).

Some of the other illustrative conclusions in the literature have been by Brennan and Auld (1968), with respect to the 1953-54 Australian budget:

> ...the general point on the use of tax cuts as a weapon of anti-inflationary policy seems well justified...a cut in <u>indirect</u> taxes would appear more likely to achieve the desired result. (p. 525).

Wilson (1972), with respect to Canada, 1964-71:

> I...conclude that the rise in indirect taxes per unit of output did contribute to inflationary pressures over the 1964-71 period. (p. 180).

Auld (1974), with respect to Canada, 1949-70:

> Our empirical results would appear to indicate that... indirect taxes do explain a significant proportion of price ...change in Canada.... (p. 150).

Brechling and Classen Utgoff (1979), with respect to the United States, 1950-77:

> The effects of changes in the indirect business tax rate (upon the rate of inflation) are...uncertain. No dominant pattern seems to emerge.... (p. 242). 1/

This paper shows, however, that the accompaniment of the assumption of demand management with tax increases could possibly compensate for the cost-push effects of such increases with a resultant negative influence on inflation. But the extent of this influence may be rather small. To end, it may be recalled that Tanzi (1977, 1978) has demonstrated that when the rate of inflation is high, collection lags are not short, and tax systems are not elastic, real revenue may fall, truncating the beneficial role of inflationary finance. This paper adds to the general concern regarding tax policy during inflationary periods in that it concludes that as inflation increases, the effectiveness of tax policy in combating that inflation decreases.

1/ Parentheses added from p. 243.

APPENDIX

Linearly Homogeneous Production Functions

Here we demonstrate that starting from a linear homogeneous production function--specifically a Cobb-Douglas production function--one could obtain a linearly homogeneous function in price changes.

$$Q = L^A K^{(1-A)} \tag{1}$$

$$\frac{W}{P} = Q_L = AL^{-(1-A)}K^{(1-A)} = A\left(\frac{K}{L}\right)^{(1-A)} \tag{2}$$

$$\frac{R}{P} = Q_K = (1-A)L^A K^{1-A} = (1-A)\left(\frac{K}{L}\right)^{-A} \tag{3}$$

Rewriting (2) and (3), respectively, we obtain

$$\left(\frac{W}{P} \cdot \frac{1}{A}\right)^{\frac{1}{1-A}} = \frac{K}{L} \tag{4}$$

$$\left(\frac{R}{P} \cdot \frac{1}{1-A}\right)^{-\frac{1}{A}} = \frac{K}{L} \tag{5}$$

Combining (4) and (5),

$$\left(\frac{W}{P} \cdot \frac{1}{A}\right) = \left(\frac{R}{P} \cdot \frac{1}{1-A}\right)^{-\frac{(1-A)}{A}}$$

or

$$P^{-\left(\frac{1}{A}\right)} = A\left(\frac{1}{1-A}\right)^{-\left(\frac{1-A}{A}\right)} W^{-1} R^{\frac{-(1-A)}{A}}$$

or

$$P = \left[A\left(\frac{1}{1-A}\right)^{-\left(\frac{1-A}{A}\right)}\right]^{-A} W^A R^{1-A} \tag{6}$$

Differentiating, and using small case letters for percentage changes

$$p = Aw + (1-A)\, r \tag{7}$$

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