The extent of the built-in stabilizing effects of taxation on the economy, particularly on inflation, have not really been studied on an empirical basis.

An Econometric Analysis of Taxation as a Fiscal Price Stabilizer 1975 - 1985

ROBERTO RAYMUNDO

Note: The study presented below reveals certain limitations which have to be dealt with on a more in-depth and comprehensive basis. The actual measure of excess demand gaps, determining the earmarking of revenues collected from indirect taxation and direct taxation and the expansion of the period of analysis is necessary to further substantiate the conclusions made in this preliminary study. Thus, this paper serves as a research proposal geared towards empirically verifying the effects of taxation on inflation, and a more comprehensive analysis is expected to complement the initial results, as the collection of data is completed.

In the realm of Public Finance, taxation being the major source of revenues for government expenditure may also serve a secondary purpose -- that of a fiscal stabilizer. Fiscal stabilization would refer to the ability of fiscal policy to control the growth or limit fluctuations in the movement of aggregate demand. Progressive taxation in particular serves as a built-in stabilizer because of the expected regulatory effects it creates on aggregate demand.

During conditions under which inflationary pressure is caused by the "demand pull" phenomena, taxes have a tendency to restrict the growth of aggregate demand by reducing the expansion of its two major components, namely: consumption and investment expenditures. Increased income taxes tend to reduce consumption as it reduces the disposable income of individuals in the economy, thus resulting in smaller amounts of money available for spending. Increasing profit taxes tend to further reduce investment expenditures because businessmen are discouraged from expanding productive activities, considering that profits are expected to be eaten up by larger taxes assessed for them.

Since these components of aggregate demand undergo contractionary effects, inflationary pressures caused by the "demand pull" phenomenon is expected to be minimized Given that aggregate output production cannot accomodate the growing aggregate demand, taxation can create a contractionary effect on aggregate demand; therefore inflation is controlled through a reduction of consumption and investment expenditures. However in the Philippine context, in connection with the anti-inflationary policies being undertaken by the Central Bank, more emphasis is placed on money supply and interest rate manipulation in order to control inflation rather than the built-in stabilizing effects of taxation. During the crisis period after 1983, lending rates increased up to 42 percent which consequently wiped out excess liquidity and resulted in a relative shortage of funds in the primary financial markets.

The extent of the built-in stabilizing effects of taxation on the economy, particularly on inflation, have not really been studied on an empirical basis. Through econometric analysis, we will try to determine the efficacy of taxation as a regulatory agent against inflation.

OBJECTIVE

The study will try to determine the extent to which taxation acts as a built-in fiscal stabilizer, particularly in its ability to control inflation. An econometric analysis will attempt to capture such an effect on the movements of the Consumer Price Index (CPI), which will be used as the measure of inflation. The statistical significance of the model will establish how much of the variations in the tax revenues collected explain the changes in CPI and how each explanatory variable is related to inflation.

THEORY

Fiscal stabilization refers to the ability of fiscal policy (either through government expenditure or taxation) to control the growth or limit fluctuations in the expansion of aggregate demand. Normally, the policy targets for fiscal stabilization either refer to increasing employment through more government expenditures (expansionary fiscal policy) or controlling the rate of inflation through higher taxes implemented (contractionary fiscal policy). Ultimately, all of these policies try to control the rate at which output will grow in the economy.

The study will concentrate on the second aspect of fiscal stabilization which is tax as a check against inflation. Increased taxation accomplishes this by restricting the growth of aggregate demand, particularly in a condition wherein the economy is already at full-employment (full employment being defined as a level of unemployment not greater than 4 percent of the labor force) (Musgrave and Musgrave, 1976). Aggregate output production at full employment which cannot accomodate increasing aggregate demand results in "demand pull" inflation. "Cost push" inflation on the other hand may also occur since at full employment, an increase in aggregate demand through higher investment expenditures may increase the demand for labor and capital inputs. This consequently pushes up wage rates and the

cost of capital, which raises the cost of production, and is finally passed on in the form of higher priced commodities. With expectations of higher prices, factor inputs will require higher returns in view of the rising cost of living. Thus a spiral effect of rising prices ensues. Excess expenditures can cause inflation if output cannot meet the growing demand. The Philippines currently has an unemployment rate of 9 percent which is less than full employment, meaning that there are still a considerable number of idle labor resources. However, the country is deficient in capital so that total resources may still not be sufficient to produce output which can match the growing demand.

The Multiplier

Theoretically, the restrictive effects of taxation on aggregate demand can be easily traced to the concept of the "multiplier effect". The multiplier effect illustrates the total expected increase in ouput caused by an initial increase in expenditures, which further generate a geometric progression of successive expenditures as money is spent from one sector to another. The multiplier formula inclusive of income taxes is represented by the following equation:

$$Y = 1 (a + I + G)$$

1 - c(1 - t)

where Y = output

c = marginal propensity to consume

t = tax rate

a = autonomous consumption

I = autonomous investment

G = autonomous government expenditure

The expression 1 - c(1 - t) represents the multiplier

or the amount (multiple) by which output is expected to increase, given an increase in expenditures. Assuming that all other variables are held constant, an increase in government expenditure by P4 million, given that c = 0.8and t = 0.1, will generate an expected increase in Y equal to P 14.28 million. The value of the multiplier is 3.57, meaning that output is expected to increase by 3.57 times the autonomous change in expenditures. Y = 1 P 4 million1 - 0.8(1 - 0.1)Y = (3.57) P 4 millionY = P 14.28 million

As taxes are increased, the multiplier becomes smaller. Given the same conditions but this time assuming the tax rate (t) is increased from 0.1 to 0.3, the increase in Y is only \clubsuit 9.08 million while the multiplier becomes smaller at 2.27.

In this regard, increased income taxes of those whose revenues move with income, generate changes which reduce the multiplier causing a relatively smaller increase in aggregate demand.

Although the multiplier shows the restrictive effect of taxation on aggregate demand, the national multiplier based on a weighted marginal propensity to consume and a weighted income tax rate for the whole Philippines may not necessarily capture the actual consumption and investment expenditure patterns in the country, because such weighted averages will not reflect the inequitable distribution of wealth and income in this nation.

Therefore in order to determine the effect of taxation on inflation, without having to regress the weighted multiplier with CPI, and without having to rely on weighted tax rates, the study undertakes a statistical regression using tax revenues collected as against the measure of inflation which is CPI.

MODEL SPECIFICATION

A. The study limits itself to two basic types of taxes as its initial explanatory variables, namely: income and profit taxes taken together, and sales taxes. Income and profit taxes normally increase as the amount of income generated rises, and since income taxes reduce disposable income, it may have a restrictive effect on consumption expenditures, thereby dampening "demand pull" inflation. Higher profit taxes may also reduce the amount of retained earnings that could be reinvested, so investment expenditures may also be dampened at higher income levels. Thus inflation is expected to fall. The sign of income and profit tax revenues collected as against CPI is expected to be negative.

B. Sales taxes on the other hand are also expected to have a restrictive effect on aggregate demand, consequently reducing inflation, assuming that the burden of taxation is passed on by the producer to the buyers. Higher sales tax rates and higher sales taxes collected would imply a larger base of product transactions involving consumption and investment expenditures. However, the presence of sales taxes would have discouraged any additional consumption and investment expenditures if these sales taxes were non-existent.

C. The extent to which taxes collected affect inflation cannot be fully captured in a realistic setting unless it is statistically tested alongside two other explanatory variables which also affect rising prices: money supply and GNP. Theoretically, when more money is allowed to circulate in the economy, either printed or through open market operations, it would create greater inflationary pressures. The excess liquidity generates more expenditures, fueling the growth of excess demand. Thus the sign of money supply relative to CPI is expected to be positive, such that as the money supply increases, the inflation rate is also expected to rise.

D. GNP, on the other hand, is expected to have an inverse relationship with inflation since a lower amount of output amidst a growing demand would result in excess demand, leading to competition of limited goods among consumers consequently bidding up prices. GNP relative to CPI should have a negative sign.

The Model

Given the theoretical concepts and the rationale behind the choice of variables, we can now formulate the model.

The equation was transformed into its logarithmic form since inflation is defined as

the rate of increase of prices, and the logarithmic transformation of CPI would give that percentage change of the dependent variable year over year.

Note that all symbols denote the logarithms of the variables:

LCPI = Bo + B1(LIPTAX) + B2(LSTAX) + B3(LM1) + B4(LGNP)

where:

CPI	= Philippine Consumer Price Index 1978 base level
IPTAX	= Income and profit taxes
STAX	= Sales taxes
M1	= Money supply
GNP	= Gross National Product
Data	

The sample period covers 1975 to 1985 or approximately 11 observations. Sources of data come from the NEDA Statistical Yearbook and publications from the Philippine Institute for Development Studies. Details on the data are given in Annexes A and B. All figures except CPI are in millions of pesos.

Estimation of the Model

The model makes use of a single equation with LCPI as the endogenous variable. The following estimate was obtained:

INDEPENDE	NT		
VARIABLE	COEFFICIENT	STANDARD ERROR	T-STATISTIC
80	5.9907764	4.2345602	1.4147340
LIPTAX	0.3761252	0.1754626	2.1436203
LSTAX	0.1571419	0.1577132	0.9963779
LM1	0.8253521	0.2532417	3.2591474
LGNP	-1.2285078	0.5056576	-2.4295253
R ² - 0.9	984024		
SER = 0	.080259		
DW = 2	.020		
F(4,6) = 92	.39		

The new estimate reveals that LM1 and LGNP have a greater impact on LCPI, and their t-statistics verify this significance. The signs of LM1 and LGNP follow the expected behavior relative to LCPI. However, for taxes, the sign of LIPTAX and LSTAX are still not consistent with theory; based on their t-statistics both seem to have insignificant effects on LCPI. At 0.05 level, the whole equation indicates a relatively good fit with $R^2 = 0.9840$ and the DW = 2.02 showing the absence of autocorrelation.

Considering the idea that tax revenues collected in the previous fiscal year are used for expenditures in the current year, a 1 year lag can be introduced in the explanatory tax variables in order to capture this condition. LM1 is also lagged (since the money supply level of the previous period may also affect inflation rates of the current period). LGNP is lagged for one period and regressed alongside LGNP of the current year.

After running an initial regression it was found that the existence of autocorrelation could not be established, indicated by a DW = 1.86.

Therefore, using the Cochrane-Orcutt technique, the problem of autocorrelation was remedied and the following model was estimated:

INDEPENDE	NT		
VARIABLE COEFFICIENTS		STANDARD ERROR	T-STATISTIC
BO	8.3982934	1.3105601	6.4081709
LIPTAX(-1)	-0.2175784	0.0415311	-5.2389271
LSTAX(-1)	0.6251490	0.0588108	10.629827
LM1(-1)	0.9187882	0.0994187	9.2416045
LGNP(-1)	3.1231151	0.5059116	6.1732431
LGNP	-4.5390079	0.5109294	-8.8838253
$R^2 = 0.96$	9777		
SER = 0.0	013461		
DW = 3.1	06294		
F(5,3) = 1,4	93.228		

The regression results just presented now appear to be more consistent with what the theory is trying to explain. Checking the t-statistics will indicate that all explanatory variables in the model are significant and that the R^2 at 0.999777 shows a good fit with the absence of autocorrelation exhibited by a DW statistic of 3.106.

EVALUATION AND ANALYSIS OF ECONOMETRIC RESULTS

he final lagged model presented above would closely approximate what theory is attempting to explain. LIPTAX_{t-1} or income and profit taxes collected during the previous period exhibit a negative relationship relative to LCPI because of the restrictive effects of higher progressive taxes on consumption and investment expenditures. Because consumers and firms notice that increasing amounts of taxes are deducted from high income and profit levels, this exhibits a tendency to discourage further consumption and investment expenditures in the succeeding period, thus restricting the growth of aggregate demand and controlling the growth of inflation caused by the "demand pull" phenomenon. In this regard, progressive taxation is effective in controlling inflation by minimizing large fluctuations in the growth of aggregate demand.

(LSTAX)_{t-1} exhibits a positive relationship relative to inflation. More sales taxes collected in the previous period would generate greater inflationary pressure. However, this doesn't necessarily follow our initial theory on the restrictive effects of taxation on aggregate demand and consequently in the control of inflation because more taxes are supposed to reduce LCPI.

But we have to consider the following point:

Theoretically, a tax increase is restrictive and will thus serve to check inflation while a tax reduction is expansionary and will tend to raise employment. However, some exceptions to the rule can be noted.

An increase in tax rates will be restrictive provided that the resulting increase in revenue does not induce a rise in public expenditures. This proviso may not hold. If policy behavior is such that a revenue gain in fact leads to a coresponding expenditure increase, the opposite is true. Expenditure policy would then become an endogenous part of the system limiting discretionary policy to tax changes. Given such perverse fiscal behavior, a tax increase makes for balanced budget expansion and is thus expansionary rather than restrictive. This applies with regard to built-in revenue gains as well as with regard to discretionary increases in tax rates. The reverse argument holds for tax reduction as an expansionary measure if accompanied by expenditure cuts. While such perverse behavior is anathema to the fiscal theorist, more worldly observers typically expect it to apply in actual practice (Musgrave & Musgrave 1976).

In the Philippines, the tax structure is considered to be more regressive because a larger amount of tax revenues are collected from indirect taxation. Therefore, if more sales taxes are collected or a revenue gain is achieved, if such revenue gain is accompanied by a corresponding government expenditure increase, the restrictive effect on consumption and investment expenditures will be offset by larger government spending, thus growth in aggregate demand is not restricted and it has a tendency to fuel demand pull inflation. This may be the reason why sales taxes of the previous period have a positve correlation with inflation in the current period.

 $(LM1)_{t-1}$ is positively related to inflation and this is consistent with theory. Higher money supply levels would generate more expenditures and fuel excess demand in the economy, causing prices to be bid up.

(LGNP) is also consistent with theory, since a smaller amount of output relative to a growing demand would push prices upward, thus rationalizing the negative relationship existing in the model.

The sign of $(LGNP)_{t-1}$ is a little unusual because, based on the model, higher output in the previous period would generate more inflation in the succeeding period, thus showing a positive correlation. The explanation for this can be found in the "cost push" phenomenon of inflation. Assuming that there was an increase in GNP during the previous period, the increase in output production could have been induced by growing consumption and investment expenditures. Such expenditures produce a derived demand for labor and capital inputs. In an economy wherein capital is deficient, and with the labor force demanding higher minimum wages, an increase in expenditures may cause the price of inputs to increase (particularly that of capital). Higher input prices fuel "cost push inflation" and consequently this is passed on in higher output prices in the succeeding period thus increasing inflation. This could explain the positive relationship existing between (LGNP)_{t-1} and inflation.

CONCLUSION

Based on the final lagged model which was subject to the Cochrane-Orcutt technique, it can be concluded from the study that for the Philippines, progressive taxation does contribute to the control of inflation because of its restrictive effects on private consumption and investment expenditures. However, for sales taxes, the opposite is true. The restrictive effects of higher sales taxes collected are offset by increases in government spending. Thus, large fluctuations in aggregate demand are not effectively controlled through the built-in fiscal stabilizing effects of sales taxes. For the Philippines, the inflation rate becomes higher as the amount of sales taxes collected increase; since this is the major component of government revenues, revenue gains automatically lead to corresponding expenditure increases.

But it is also important to note that inflation in this country is not only caused by "demand pull" forces but also by "cost push" factors. The high cost of imported inputs tends to increase production costs which get passed on as higher commodity prices. The input taxes collected may also increase production costs which would further fuel inflation, but this could be better discussed as the topic of another study.

Money supply and GNP are still the most significant explanatory variables which affect inflation. Changes in money supply were shown to be a more effective instrument of price stabilization policy, and an adequate explanation of the inflation phenomenon should always call for fuller consideration of the role of money supply (Musgrave & Musgrave 1976).

POLICY IMPLICATIONS

Since the tax system in the Philippines Stends to be more regressive than progressive (because more revenues are collected from indirect taxation), the built-in fiscal stabilizing effects of progressive taxation on prices can only be realized if an increase in the proportion of revenues collected from direct taxation is achieved. On the other hand, the restrictive effects of sales taxes on aggregate demand are not significantly felt because these are offset by corresponding increases in government spending.

Developing Third World countries have relatively larger proportions of government expenditure to GNP. Because of this, the restrictive effects of sales taxes on private consumption and investment expenditures is offset by greater government spending. Thus higher sales taxes collected in general may result in higher inflation rates as long as sales taxes occupy the major bulk of tax revenues collected.

The same conclusion may be applied to socialist countries whose share of government expenditure to GNP is relatively larger compared to developed capitalist economies, who in fact rely more on the private sector to generate growth. For well developed capitalist economies, taxation as a fiscal stabilizer of prices may be maximized since they can afford to raise taxes and undertake cuts in government spending without having to sacrifice growth. Thus the restrictive effects of taxation on aggregate demand can be realized, resulting to a more effective control of inflation.

Third World countries cannot afford cuts in government spending, so even if taxes are increased, the restrictive effect on aggregate demand is not realized. Thus it is also important to take into account the role of money supply as the major policy measure **Fiscal Price Stabilizer**

which is used to control inflation by wiping out excess liquidity and consequently eliminating excess demand.

Musgrave, R. and P. Musgrave. 1976. Public finance in theory and practice. Second edition. McGraw-Hill, Inc.

REFERENCES

- Intrilligator, M. 1978. Econometric models, techniques and applications. North-Holland Press.
- Kortweg, P. and A. Meltzer. Inflation and price changes: Some preliminary estimates and tests of alternative theories.
- Manasan, R. and R. Querubin. 1986. Revenue performance of national government taxes 1975 - 1985. PIDS Staff Paper # 8701.





ROBERTO RAYMUNDO is a faculty member of the Economics Department, College of Business and Economics. He obtained his Bachelor in Science Applied Economics at De La Salle University. Presently, he is pursuing his Masters of Science in Economics at the Graduate School of Business and Economics.