The Pakistan Development Review
33:4 Part II (Winter 1994) pp. 1089–1098

The Determinants of Tax Buoyancy: An Experience from the Developing Countries*

QAZI MASOOD AHMED

International comparison of fiscal efforts of developing countries was a fascinating area of public finance in the 1960s and 1970s. The famous studies in this area were Harley (1965); Lotz and Morss (1967); Raja (1971); Raja *et al.* (1975) and Roy (1979). Most of these studies used ordinary least square (OLS) technique to estimate the determinants of the total tax to GDP ratio and the most common exogenous variables used by these studies were share of agriculture sector, share of industrial sector, share of foreign trade and per capita income. Some studies used the level of monetisation, somes used the level of education and other used the level of urbanisation as exogenous variables in the estimation of tax potential of different developing countries.

The present study instead of exploring the determinants of tax to GDP ratio attempts to explore the determinants of buoyancy of the taxes i.e. the total taxes, direct taxes and indirect taxes. The buoyancy of a tax measures the total response of tax revenue to change in income. The scope of the study also includes the ranking of developing countries on the basis of actual to predicted values of these buoyancies. The study would have been more useful if the study could find the determinants of the elasticity of these taxes, but due to nonavailability of data on the discretionary measures for each tax this was not feasible. The paper is organised as follows, Section I describes the theoretical basis of the model, Section II gives methodology and data collection, Section III gives results of the model and Section IV summarises the main conclusions.

I. THEORETICAL MODELLING AND HYPOTHESIS

Exploring the determinants of buoyancy involves regressing the variable of buoyancy on the variables that serve as proxies for a country's "tax handles". The

*Owing to unavoidable circumstances, the discussant's comments on this paper have not been received.

Qazi Masood Ahmed is Assistant Professor at the Applied Economics Research Centre, University of Karachi, Karachi.

following equation is estimated.

$$\frac{b_i^{\lambda}-1}{\lambda} = \beta_0 + \beta_1\left(\frac{g_{imp}}{g_{gdp}}\right) + \beta_2\left(\frac{g_{ind}}{g_{gdp}}\right) + \beta_3\left(\frac{g_{ser}}{g_{gdp}}\right) + \beta_4\left(\frac{g_{agr}}{g_{adp}}\right) + \beta_5\left(\frac{g_{money}}{g_{gdp}}\right) + \beta_6\left(\frac{g_{deficit}}{g_{gdo}}\right) + \beta_7\left(\frac{g_{grant}}{g_{gdp}}\right) + \beta_8\left(\frac{Tax_i}{GDP}\right)_{78} + \varepsilon_i$$

b_i = Buoyancy of the taxes (total tax, direct tax, indirect tax), λ assumed to be 1 in our study;

g_{imp} = Average growth in import;

g_{ind} = Average growth in industrial sector's output;

g_{ser} = Average growth in services sector's output;

g_{agr} = Average growth in agricultural sector's output;

g_{money} = Average growth in money supply;

$g_{deficit}$ = Average growth in deficit, (Deficit is calculated by subtracting expenditure from revenues);

g_{grant} = Average growth in grant;

Tax_i = Total taxes or direct tax or indirect taxes; and

g_{gdp} = Average growth in GDP.

$\left(\frac{g_{imp}}{g_{gdp}}\right)$ = Average growth of imports sector divided by the growth of gross domestic product. In most developing countries the contribution of the import sector in the national exchequer is very significant. It is expected that through import duties growth in the import sector will increase tax collection. In many developing countries the withholding income tax at the stage of import is also introduced. So growth in imports not only increases growth in indirect taxes but also increases growth in direct taxes. So the expected sign of this variable in regression analysis is positive.

$\left(\frac{g_{ind}}{g_{gdp}}\right)$ = Growth in industrial sector divided by growth in gross domestic sector. This variable will capture all effects of growth in the industrial sector on the revenue generating potential of developing countries. Increase in industrial sector will increase indirect taxes through excise duties, sales tax on domestic products and surcharges and direct taxes

through corporate income tax. The expected sign of the variable is positive in regression analysis.

$\left(\frac{g_{agi}}{g_{gdp}}\right)$ = Growth in agriculture sector divided by growth in gross domestic product. In most developing countries the share of the agriculture sector in gross domestic product is very significant and due to strong agricultural lobbies the governments are unable to impose taxes in this sector. Therefore the agricultural sector has been used as a tax evasion funnel for the income which has been generated in the non-agricultural sector. This variable due to this reason may negatively influence the collection of taxes generally and direct taxes particularly. So, the expected sign is ambiguous in the regression analysis.

$\left(\frac{g_{serv}}{g_{gdp}}\right)$ = Growth in services sector divided by the growth in gross domestic product. In most of the developing countries the major portion of the services sector comprises of the informal sector. Therefore in these countries the tax collection through the services sector is very small in fact this may have negative effects on collection if people conceal their regular income through the activities of these sectors. Therefore in this study the expected sign is ambiguous.

$\left(\frac{g_{mon}}{g_{gdp}}\right)$ = Growth in monetary sector divided by the growth in gross domestic product. Increases in monetisation will increase the documentation of the economy which will increase the collection of each taxe. Therefore the study assumes a positive sign in the regression analysis.

$\left(\frac{g_{gra}}{g_{gdp}}\right)$ = Growth in grant divided by growth in domestic product. Increase in foreign resources makes governments in the developing countries relaxed and due to fear of any political unpopularity the governments rely less on domestic resource mobilisation. Therefore an increase in foreign grants is expected to influence the buoyancy of the taxes negatively.

$\left(\frac{g_{deficit}}{g_{gdp}}\right)$ = Growth in deficit divided by growth in gross domestic product. Huge budget deficit is one major economic problem faced by the developing economies. The International Monetary Fund, World Bank and other international lending agencies impose different conditionalities to reduce the budget deficit. One of the conditionalities is to reduce the budget deficit through increase in new taxes and improving existing taxes by removing different allowances and exemptions. It is therefore expected that the increase in deficit will compel government(s) in developing countries to increase collection through new as well as

existing taxes. So the expected sign is positive in the regression analysis.

$\left(\frac{Tax}{GDP}\right)_{Base\ Year}$ = It is expected that the tax to GDP ratio of base year (in our study 1978) will also affect the buoyancy of taxes in the subsequent year. The expected sign is positive.

II. METHODOLOGY AND DATA COLLECTION

In the first step buoyancy of each tax is estimated with the help of the following equation:

$$\text{Log } T_i = \alpha_0 + \alpha_1 \text{ Log } GDP$$

Where;

$\text{Log } T_i$ = Log of tax (total tax or direct tax or indirect tax); and
$\text{Log } GDP$ = log of gross domestic output.

Direct taxes include income and corporate taxes, indirect taxes include customs duties, excise duties and sales taxes and total taxes include all these taxes plus gratuity fund and other employer contributions. In the second step these buoyancies are used as a dependent variable and ordinary least square method is being used to find the determinants of buoyancy of each tax. The exogenous variables are discussed in Section I. Data on each variable for 35 developing countries for ten years has been collected from Government Finance Statistics, World Tables and International Financial Statistics. IMF (Various Issues). The names of the countries and actual values of the buoyancies are given in Table 1.

Annual growth of each variable is computed and then the average of this growth is used as the exogenous variable in the regression analysis. Each exogenous variable has been divided by the growth of gross domestic product to make each variable standardised.

III. RESULTS

The results of the study is given in Table 2 and possible explanation are given below separately for direct taxes, indirect taxes and total taxes.

Direct Taxes

In the case of direct taxes all variables have been tested in different combination and the best equation is reported in Table 2. For direct taxes both

Table 1

Buoyancies of the Taxes of Developoing Countries

Countries	Total Taxes	Direct Taxes	Indirect Taxes
Pakistan	1.13	1.10	1.29
Bangladesh	0.36	0.39	–0.58
Sri Lanka	0.80	1.43	1.62
Indonesia	0.51	0.58	0.90
Nepal	1.10	1.41	0.60
Singapore	0.75	0.76	0.56
India	1.05	0.64	0.86
Malaysia	0.98	1.38	1.20
Philippines	0.77	0.54	1.01
P. New Guinea	1.13	1.62	0.18
Burma	1.13	0.63	0.81
Thailand	0.66	0.86	0.68
Korea Rep of	0.92	1.10	0.89
Sudan	0.00	0.00	1.09
Zambia	0.56	0.94	0.12
Morocco	1.03	1.15	1.20
Brundi	0.06	0.94	0.09
Ghana	0.47	1.12	0.92
Kenya	0.82	0.70	0.81
Cameroon	3.19	5.65	1.42
Mauritania	0.00	–0.37	3.07
Mexico	0.00	0.00	0.06
Costarica	1.12	0.67	1.10
Uruguay	1.00	0.99	1.05
Paraguay	0.53	0.87	0.37
Chile	1.28	1.69	0.93
Colombia	0.69	0.48	0.70
Guatemala	–0.67	–0.38	–0.88
Honduras	0.98	1.31	0.85
Ecuador	1.78	2.24	1.62
Haiti	1.52	1.27	1.79
Jamaica	0.63	1.63	0.39
Peru	0.58	0.91	0.57
Nicaragua	1.77	1.95	1.68
Average	**0.92**	**1.13**	**0.85**

Table 2

Determinants of Tax Buoyancy

Independent Variable	Direct Taxes	Indirect Tax	Total Taxes
C	–.344 (.15)	–.72 (.24)	–0.777 (0.23)
$\left(\frac{g_{imp}}{g_{gdp}}\right)$	.025 (.008)***	.04 (.01)***	0.028 (0.01)***
$\left(\frac{g_{ind}}{g_{gdp}}\right)$	0.16 (.04)***	.27 (.11)***	0.182 (0.09)***
$\left(\frac{g_{sev}}{g_{gdp}}\right)$	–	–	–
$\left(\frac{g_{agr}}{g_{gdp}}\right)$	–	–.13 (.11)	–0.082 (0.07)
$\left(\frac{g_{money}}{g_{gdp}}\right)$	0.26 (0.07)***	.17 (.06)***	.30 (.07)***
$\left(\frac{g_{deficit}}{g_{gdp}}\right)$	–	.011 (.005)**	.004 (.003)
$\left(\frac{g_{grant}}{g_{gdp}}\right)$	–.005 (.001)***	–.009 (.002)***	–0.007 (.001)***
$\left(\frac{Tax_i}{GDP}\right)_{78}$	–.039 (.01)***	.008 (.001)	0.008 (.007)
$\overline{R}^2$	.65	.52	.65
D. W.	2.18	1.53	1.58
F-statistics	11.65	5.43	8.74

* Significant at 90 percent level of confidence.
** Significant at 95 percent level of confidence.
*** Significant at 99 percent level of confidence.
() Parentheses shows standard error.

growth in industrial sector and growth in imports are significant at the 99 percent level of confidence and shows a positive sign. This indicates that growth in the industrial sector raises the level of direct taxes collected through corporate income tax, and super tax. Growth in the import sector also increases direct tax collection. Traditionally no direct tax has been imposed at the import stage, but in the last two decades withholding income tax at the stage of import is being collected in many developing countries. Since this is collected at the source, so possibility of evasion is minimised and therefore growth in imports significantly influences the collection of direct taxes.

Growth in monetisation is denoted by M_2, shows a positive sign and is significant at 99 percent level of confidence. This shows that as level of monetisation increases, documentation of financial transactions of the economy increases. this increase in documentation facilitates the collection of direct taxes.

Growth in grant affects the buoyancy of the direct tax inversely, which shows that as the foreign aid inflow in the economy increases, governments in developing countries reduce their effort to increase domestic resources through direct taxes.

Base year direct tax to GDP ratio is also significant at 99 percent level of confidence and has a negative sign. This indicates that buoyancy of the direct tax in subsequent years increases for those countries where direct tax to GDP ratio in the base period was low.

Indirect Taxes

The buoyancy of the indirect tax is positively influenced by the growth in the industrial sector and growth in import sector and negatively influenced by the growth in the agriculture sector. The first two variables are significant at the 99 percent level of confidence. Growth in imports increases the collection of indirect taxes through import duties and sales tax on imports and growth in the industrial sector increases the collection of indirect taxes through excise duty, surcharges and sales tax on domestic output. Growth in agriculture sector has a negative sign but is insignificant.

Growth in monetisation is represented by M_2, also influences significantly and positively the buoyancy of the indirect taxes. The increase in monetisation increases documentation of financial transactions which increases collection of excise duty and sales tax, and value-added tax.

Increase in deficit which is the most important budgetary problem of the developing countries, increases buoyancy of indirect tax. This is the expected sign because increase in deficit pressurises the governments of developing countries to

increase domestic resources either through new taxes or better administration. But due to strong lobbies government(s) in developing countries usually opt for indirect tax.

Growth in grant on the other hand, by filling the budget gap temporarily, adversely affects the attitude of the developing countries to increase domestic resources through taxes.

Base year indirect tax to GDP ratio shows positive sign but remain insignificant. This shows that despite positive influence of base year indirect tax to GDP ratio the result is inconclusive.

Total Taxes

Buoyancy of the total taxes are positively influenced by the growth in the industrial sector and growth in imports. Coefficient of variables of growth in imports and growth in industrial are significant at 99 percent of level of confidence. This shows that increase in domestic production and imports through excise duty, corporate income tax and import duties increases the collection of taxes. The variable of agriculture sector is significant at very low levels of confidence, but shows a negative sign which may point toward the tax evasion funnel which reduces collection of income tax.

Level of monetisation (M_2) is significant at the 99 percent level of confidence and shows a positive sign which implies that increase in monetisation increases documentation of the economy which increases the tax collection.

Budget deficit is the most important problem of the developing countries and it was expected that increases in deficits will increase the efforts to increase the buoyancy of the taxes. However results show that the variable is insignificant despite the correct positive sign.

Growth in grant is another variable which is significant at the 99 percent level of confidence and inversely affects the efforts of the government for domestic resources mobilisation. This variable shows the grant from rich countries, and other international lending institutions significantly influences the decision of the government of debtor developing countries, and can be presented as a valid explanation for low buoyancy of the taxes in developing countries.

The other variable the base year tax to GDP ratio shows a positive sign but remains insignificant. It is not clear to what extent the base year tax to GDP ratio influences the buoyancy of taxes in subsequent years.

The ranking of developing countries according to their fiscal effort measured in term of actual to predicted values of buoyancies is shown in Table 3.

Table 3

Ranking of Developing Countries according to Ratio of Actual to Predicted Values of Total Direct and Indirect Taxes

Countries	Total Taxes	Direct Taxes	Indirect Taxes
Indonesia	1	15	17
Ghana	2	26	19
Jamaica	3	1	2
Singapore	4	13	4
Zimbabwe	5	33	31
Brundi	6	20	8
Bangladesh	7	2	32
Nicaragua	8	8	3
Zambia	9	9	7
Kenya	10	16	29
Paraguay	11	14	9
Guatemala	12	10	10
Sri Lanka	13	29	33
Ecuador	14	12	12
Syria	15	19	13
Colombia	16	5	28
Thailand	17	6	11
Chile	18	11	25
Korea	19	25	16
Malaysia	20	28	24
Philippine	21	3	34
Nepal	22	18	1
Honduras	23	23	14
Uruguay	24	21	21
Morocco	25	22	23
India	26	7	18
Costarica	27	31	22
Pau. New Guinea	28	35	5
Burma	29	24	15
Pakistan	30	17	27
Mexico	31	34	6
Mauritania	32	35	4
Haiti	33	27	30
Cameroon	34	32	26
Sudan	35	30	20

IV. CONCLUSION

This study which attempts to explore the determinants of buoyancy of the taxes by using the data of 35 developing countries concludes that growth in the foreign sector (import) and industrial sector positively influences the growth of taxes in the developing economies. However the effects of the other sectors like services and agriculture remain inconclusive. Increase in level of monetisation through increase in documentation, also facilitates the growth of taxes. However, growth in grant inversely affects the efforts of the developing countries for domestic resource mobilisation. Increase in budget deficit compels governments of the developing countries to increase domestic resource mobilisation but mostly these governments rely on indirect taxes in this regard. Effects of base year tax to GDP ratio on the growth of these taxes in the subsequent year are also inconclusive in most cases.

REFERENCES

Harley, H. Hinrichs (1965) Determinants of Governments Revenue Shares among Less-developed Countries. *The Economic Journal* 75.

Lotz, and Elliot R. Morss (1967) Measuring Tax Efforts in Developing Countries. (Staff Paper, 14).

Raja, J. Challiah (1971) Trends in Taxation in Developing Countries. (IMF Staff Paper.)

Raja, J. Challiah, Hassel, Baas and Margaret Telly (1975) Tax Ratio and Tax Effort in Developing Countries, 1969-71. (IMF Staff Paper.)

Roy, W. Bahl (1979) Representative Tax System Approach to Measuring Tax Efforts in Developing Countries. (IMF Staff Paper.)

International Monetary Fund (Various Issues) *International Financial Statistics.* International Monetery Fund.

International Monetary Fund (1988) *Development Financial Statistics.* IMF.

World Bank (Various Issues) *World Development Tables.* World Bank.