Is Low Responsiveness of Income Tax Functions to Sectoral Output an Answer to Sri Lanka's Declining Tax Revenue Ratio?

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Introduction

From 1950s to the present, the economic structure of Sri Lanka has changed significantly.Six or seven decades ago the country was highly dependent on its agricultural sector. But the GDP of the country today is mostly generated in service and industrial sectors. Since domestic agriculture is a small scale subsistence sector, one may not expect high contribution of that sector to the tax revenue. But the growth of industrial and service sectors results in large corporate sector and raises the income of employees of the sectors. Therefore, the expansion of services and industrial sector is expected to generate high positive impact on the tax revenue, especially income tax revenue. This study focuses on long-term tax elasticities of income taxes of Sri Lanka in relation to changes in the sectoral composition of output.

Tax buoyancy is an indicator to measure the efficiency and responsiveness of revenue mobilization in response to growth in the tax base, GDP or national income. A tax is said to be buoyant if tax revenue increases more than proportionately in response to a rise in the tax base. If the tax revenue shows less responsiveness to tax base, that type of taxes fails to generate enough revenue for the government in the long run. Ahmad (1994) finds that the expansion in agricultural and service sectors is not very important in the determination of tax revenue. But the industrial sector growth reports a positive impact on tax revenue collection of developing countries. Tancy and Zee (2001)

find the uncertainty of agricultural income and informal sector income as a reason for low tax collection in developing countries.

Indraratne (2003) cites tax evasion, tax avoidance and tax incentives as major reasons for the low responsiveness of taxes to the national income. Waidyasekar (2004) and Jayawickrama (2008) reveal that the buoyancy of corporate income tax and goods and service taxes are low and that caused a decline trend in the average tax ratio. There are many studies that focused on tax buoyancy of Sri Lanka using GDP as the tax base. No studies used segregation of tax based, as agriculture, industry and services incomes to examine the responsiveness of taxes to changes in sectoral output.

Objective

The objective of this study is to examine the responsiveness of income tax functions of Sri Lanka with respect to changes in the composition of GDP in order to find an answer to declining trend in the tax revenue ratio.

Methodology

This study estimates personal income tax and corporate income tax functions of Sri Lanka using annual data from 1973 to 2013. In this study, tax revenue is assumed to be a function of tax base (y_t), average of marginal tax rates (τ_t) and some unobserved factors (u_t). In order to find the elasticity parameter with respect to tax base, the study uses the following logarithmic form in the estimation:

$$\ln(tax_t) = \beta_0 + \beta_1 \ln(y_t) + \beta_2 \tau_t + u_t \quad \text{.....(1)}$$

The parameter β_1 in (1) can be interpreted as long-term income (tax-base) elasticity of tax revenue. The income elasticity of tax is important in determining the buoyancy of a tax or a tax system and tax buoyancy requires β_1 in (1) to be greater than one. This study separates y_t in (1) to

y_t^{agr}, y_t^{ind} and y_t^{ser} which represent agricultural, industry and service sector output respectively. With this modification (1) can be written as

$$\ln(tax_t) = \beta_0 + \beta_1^{agr} \ln(y_t^{agr}) + \beta_1^{ind} \ln(y_t^{ind}) + \beta_1^{ser} \ln(y_t^{ser}) + \beta_2 \tau_t + u_t \ldots.(2)$$

In which β_1^{agr}, β_1^{ind} and β_1^{ser} are sectoral-output elasticity of tax revenue. Since the regressant and regressor variables in (2) are non-stationary, the Least Squares method of estimation does not produce reliable estimates for parameters of (2). However, the long-term parameters of (2) can be derived from a dynamic model in a form of an autoregressive distributed lag (ADL) model. Since (2) contains I(1) variables, an I(0) error term indicates that (2) is a cointegrating regression in which the least squares parameter estimates are super-consistent. The ADL type dynamic model generates long-term (cointegrating) solutions with standard t and F distributions (Pesaran and Shin, 1998).

Results and Discussion

Equation (2) is estimated using personal income tax revenue and corporate income tax revenue as dependent variables. The real values of income taxes and sectoral output are obtained by deflating them by the GDP deflator. The tax rates used in the two tax functions are average personal income tax rate and the average corporate income tax rate.

Tables 1 and 3 give the ADL estimation of personal and corporate income tax functions (see in Annexure A). The lag length of the estimated models is set to one by AIC and SC model selection criteria. The estimated models were subject to tests on auto-correlation, auto-regressive conditional heteroscedasticity, normality of the error term, heteroscesdasticity and regression specification errors. Tables 2 and 4 give the long-term relationships of the relevant tax functions.

In the dynamic model of the personal income tax function, a level dummy was included for the year 2012 to hold an unpredicted fall in

tax revenue. The model has an impressive predictive power and passes all diagnostic tests. The error correction unit root test statistic (= -8.139) indicates that the static solution is a cointegrating one.

As in Table 2, the average personal income tax rate has a highly significant positive impact on the revenue of personal income tax. The real income of the agricultural sector is not a determinant of the personal income tax revenue. This result is quite meaningful as small scale agriculture does not influence income taxation. As indicated by the responsiveness parameter of industrial sector output, one percent increase in industrial income will result in 0.28 percent increase in personal income. On the other hand, one percent increase in service sector income brings about 0.58 percent increase in the personal income tax revenue. This impact is twice higher than the impact of the industrial sector. This is also interesting as most of the income tax payers work in service providing entities of the public and private sectors. Compared to service sector, the expansion of the industrial sector does not have a large impact on personal income tax. To sum up, the above results indicate that the personal income tax does not increase at the same rate of economic growth.

Table 3 gives the results of the dynamic model of corporate income tax revenue. The model selection criteria permit us limiting the lag length to one. The model explains more than 99 percent of the short-term variation of the corporate income tax revenue. Dummy variables are used to control for unexplained fluctuations in 1980 and 2002. The diagnostic tests of model indicate that there is no issue in the model.

The agricultural sector is insignificant in explaining corporate income tax too. The industrial sector output has a highly significant positive impact on the corporate income tax revenue. One percent increase in industrial sector income increases corporate income tax by 0.55 percent. On the other hand, service sector income has a marginal impact on corporate income tax, one percent increase in service sector output increases corporate income tax revenue by only 0.29 percent.

This effect is significant only at 10%. Therefore, corporate tax revenue shows a low responsiveness to service sector output. This low responsiveness of corporate income tax to service sector output could be a reason for declining tax ratio in Sri Lanka. Since the service sector is the fastest growing sector in the economy at present, one may wonder why the expansion of servicessector has only a marginal impact on corporate income tax revenue collection.

Conclusion

The study finds that agricultural sector expansion has no real impact on personal income tax and corporate income tax collections. The non-responsiveness of income taxes to agricultural real output can be one reason for non-buoyancy and perhaps for the decrease in tax revenue to GDP ratio. Personal income tax has a higher responsiveness to service sector income than the industrial sector income. It may lead to one doubt that most of the service sector income is distributed among its employees and more of industrial sector income is accumulated within corporations as undivided profits. The accumulation of corporate profits within companies may be a reason for relatively high responsiveness of corporate tax revenue to industrial sector output. The less responsiveness of corporate income tax to service sector income questions the structure of the service providing companies in Sri Lanka. The non-accumulation of corporate profits within service providing companies may be a reason for low responsiveness. As the service sector becomes the fastest growing sector in Sri Lanka, this less responsive may result in non-buoyancy and a declining tax revenue to GDP ratio. The results of this study have important implications for tax policymakers. Attention should be given to improve the efficiency in tax system in response to changes in the structure of the economy.

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Appendix

Table 1: Regression Results: ADL(1,1) Model of Personal Income Tax
Dependant variable, ln(pit)

Variable	Coefficient	t value	Prob of t value
Constant	-3.755	1.04	0.305
ln[pit (t-1)]	0.114	-7.64	0.000
$\ln[y^{agri}(t)]$	0.017	0.12	0.902
$\ln[y^{agri}(t-1)]$	-0.049	-0.37	0.715
$\ln[y^{ind}(t)]$	0.095	0.81	0.426
$\ln[y^{ind}(t-1)]$	0.155	1.41	0.169
$\ln[y^{ser}(t)]$	0.592	9.36	0.000
$\ln[y^{ser}(t-1)]$	-0.083	-1.11	0.274
τpit(t)	1.285	26.4	0.000
τpit(t-1)	-0.056	-0.41	0.686
2012	-0.213	-4.37	0.000
R^2	0.995	ARCH 1-1 F	0.098 [0.757] †

		test	
DW	2.09	Normality Chi^2 test	2.962 [0.227] †
n	40	Hetero F test	0.902 [0.597] †
AR 1-2 F test	1.625 [0.216]†	RESET F test	0.039 [0.844] †

† test statistcs are given in brackets.

Table 2: Solved Long-run Solution of the Personal Income Tax Function

Dependent variable, ln(pit)

Variable	Coefficient	t value	Prob of t value
Constant	-4.236	-25.2	0.000
$\ln[y^{agri}(t)]$	-0.036	-0.42	0.679
$\ln[y^{ind}(t)]$	0.282	3.42	0.002
$\ln[y^{ser}(t)]$	0.575	7.48	0.000
τpit(t)	1.387	22.0	0.000
Long-run sigma	0.0468	Error Unit Root Test	-8.139***
Wald test Chi^2	3539.2 (0.000)†		

† test statistcs are given in brackets.

*** Significant at 1%

Table 3: Regression Results: ADL(1,1) Model of Corporate Income Tax

Dependant variable, ln(cit)

Variable	Coefficient	t value	Prob of t value
Constant	-1.784	-2.77	0.010
ln[cit (t-1)]	0.555	4.07	0.000
$\ln[y^{agri}(t)]$	0.438	2.66	0.013
$\ln[y^{agri}(t-1)]$	-0.362	-2.52	0.018
$\ln[y^{ind}(t)]$	0.512	3.78	0.001
$\ln[y^{ind}(t-1)]$	-0.268	-2.06	0.049
$\ln[y^{ser}(t)]$	0.391	5.72	0.000
$\ln[y^{ser}(t-1)]$	-0.261	-3.12	0.004
τcit(t)	0.553	22.5	0.000
τcit(t-1)	-0.292	-3.75	0.001
1980	-0.161	-2.96	0.006
2002	-0.124	-2.46	0.020
R^2	0.993	ARCH 1-1 F	1.520 [0.229] †

		test	
DW	1.95	Normality Chi^2 test	1.513 [0.469] †
n	40	Hetero F test	0.739 [0.722] †
AR 1-2 F test	0.938 [0.404] †	RESET F test	1.760 [0.196] †

† test statistcs are given in brackets.

Table 4: Solved Long-run Solution of the Personal Income Tax Function

Dependent variable, ln(cit)

Variable	Coefficient	t value	Prob of t value
Constant	-4.012	-9.25	0.000
$\ln[y^{agri}(t)]$	0.170	1.02	0.314
$\ln[y^{ind}(t)]$	0.548	3.00	0.005
$\ln[y^{ser}(t)]$	0.291	1.77	0.086
τcit(t)	0.589	8.72	0.000
Long-run sigma	0.101	Error Unit Root Test	-3.258*
WALD test Chi^2	734.3 (0.000) †		

† test statistcs are given in brackets.

*** Significant at 1%.