Determinants of Low Tax Revenue: A panel Data Analysis

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Abstract
This study is examined the determinants of tax to GDP ratio and to capture the reasons of consistently low tax to GDP ratio for 27 low and high income countries over 2000-2014. To investigate the relationship, we have employed random effect and Arellano bond model. The empirical results showed that tax to GDP ratio has strong link with trade, capital inflow, tax base, corruption and per capita income. The findings exposed that trade openness, capital inflow and per capita income have the positive and significant impact on tax to GDP ratio. The study also found that tax base is positively related to the tax to GDP ratio, as tax base widened, tax to GDP ratio increases.

Keywords: Tax to GDP Ratio, Trade Openness, Capital inflow, Arellano-Bond Model
JEL Codes: H2, B27,

I. Introduction

It is said that "*what the government gives, it must first takes away".* Whenever the discussion over the problems of a state government starts, it is of crucial importance that from where it overcomes the revenue gap. For developing countries, infrastructure building, and human capital accumulation are the most targeted phenomenon for growth and development but both require huge government investment because people are unable to bear full cost of these investments. Then the thing comes to stick the mind, from where such increasing expenditures cover up?

Education, health, infrastructure and other social programs are prerequisites for a stable economy and for sustained growth process. To finance these public goods and services, tax revues are the common and extensive part of government budget. It is a widely held belief that the welfare costs of resource misallocation (both intra and inter temporally) increase with increased taxation. Developed countries mostly rely on income taxes while the trend is not same in the developing countries. According to Zee, H. (1996), the situation is quite reverse for developing countries as they mostly rely on trade and other such kind of revenues instead of income and consumption taxes adopted by developed countries. He is also reported that developed countries are used to tax 7% higher in income and consumption bracket while the same statistic on trade is 23% lower than that of developing countries.

Globalization and financial integration are expected to act like a fiscal denominator for government revenues because as countries become more integrated; they use to dismantle different kind of trade barriers and other restrictions. This leads to a decrease in government revenues but in the short run. In the long run, countries got excessive profits from their shift of easy to collect taxes like tariffs, and hard to collect taxes like income and value added. Tax structure affects the tax revenues of a government; the more complicated the structure of tax, the higher will be the tax evasion in the society leading to a sharp revenue cut and increased administrative burden on the government. It is observed that the countries with less trade barriers and high ratio of trade across borders have high tax to GDP ratio as they get specialization and economic efficiency. Tax to GDP ratio is the best measure represents government's administrative efficiency. It is a good to transfer resources from private to public sector and to finance government expenditures. There are some other ways to finance government needs that are commonly used in administratively less efficient and weak governments e.g. printing more money, charging for publicly provided goods or borrowing. Most of the time, it is seen that structural weaknesses and inefficient institutions with excessive corruption became the reason of low tax to GDP ratio in the developing countries. A very interesting study by Tanzi, V. (1987) provided the strong evidences that institutional quality and bribery in tax departments are significant determinants of the low tax to GDP ratio in developing countries.

Pakistan is one of the developing countries who are facing internal as well as external problems in making a stable growth path. However, it is worth noting that in the previous five to eight years, government has taken some steps in order to narrow the increasing gap of expenditures and revenues. According to the report of federal board of revenue Pakistan (FBR) 2012, in the past few decades, revenues in Pakistan have raised in such an inefficient way that has increased importance of some sectors and people's attention is concentrated towards some specific sector. The unmatched and unnecessary exemptions to unsuitable sectors and biased concessions to rich and mighty class of the society have distorted the whole system. Most commonly, in the military era, the tax cuts and reforms introduced were totally unfavorable to the economy. Structural weaknesses of this kind have increased Pakistan's vulnerability to economic shocks. For better and stable tax to GDP ratio, tax base should be proportional to the sectors of the economy that is not the case here and in fact in most developing countries. Pakistan's tax to GDP ratio is less than 10% that is among the lowest in the world while the same for developed economies is more than 30%. Present tax structure of Pakistan is distortionary and inequitable so there is very high gap in potential and actual tax collection. The figure should be same if there is no tax evasion but present tax structure is supportive of tax evasion and tax hide. Public trust, effective administration, penalties, regulations and effectiveness and certainty of tax policy are the factors that make people willing to pay tax but these are not applied here as they never exist. Over the past few years, major changes have been made in regard to the structure and incidence of the taxes and that is a positive step to push the ratio of tax to GDP a little bit up. The argument still there is that institutions are not so efficient that the whole process be made in the least costly way. Corruption and political decision making are the big reasons for slow progress of any reforms taking place in this regard.

The foremost objective of this study is to analyze the main determinants of low tax to GDP ratio of Pakistan comparing with the same of different countries across the world including some of them from high income group and some from developing world. The main variables that this study analyzes are covering inflow of capital, political and institutional quality and tax capacity along with the dependent variable as the tax base. Next section

covers the review of literature that how the issue is discussed so far. Section 3 briefly introduces the data and methodology while section 4 explains the results. Section 5 concludes while the last one contains appendix.

II. Literature review

Guo, Y. (2013) found that China has overcome the dilemma of low government revenues by implementing increased tariffs and trade liberalization policy. Fricke & Sussmuth (2014) studied the tax revenues and focused on major sources of revenues like VAT, social security contributions and revenues from commodities in Latin America using ARDL model. The results show that more than half of the economies recorded significant tradeoff between growth and volatility of revenues.

Chaudhry & Munir (2010) attempted to find out the determinants of low tax to GDP ratio in Pakistan on the basis of 37 years' time series data. The theme of the paper is that self-sufficiency of Pakistani govt. is dependent on the ability of the govt. to increase its revenues. The results suggested that openness, broad money, external debt, foreign aid and political stability to be the significant determinants of tax revenues, while agriculture share, manufacturing share and services share of GDP turned out to be in significant determinants of the same.

Zee, H. (1996) reported the relationship between economic growth and level, structure and instability of taxation are found to be insignificant for each country group. Aizenman & Jinjarak (2009) analyzed the impact of globalization on how developing countries shift their revenue source from "easy to collect" taxes to "hard to collect" taxes, using gravity model to predict the instrument of the globalization factors. Tait et al. (1979) used different proxies for tax base to compare the development of tax to GDP ratio in the developing countries over time. They used international tax comparison (ITC) and average tax ratios to compare how countries are developing their revenues capacity over time. The study analyzed three models, one for 47countries for 1969-71 and 1972-76 separately, and third for a sample of 63 developing countries over 1972-76. The results reported that, although, developing countries have increased their tax ratios but even then it is far below than that of developed countries.

Merrifield (2000) studied the determinants of fiscal decision making altogether. He collected more reliable and wide range of data than that used in the previous studies of the same kind. The data contained three observations for each country first for 1980, second for 1985 and third for 1990. The value of closest year is used when the data for some country is not reported for either year as the variables used in the study are to capture regional and institutional effects and their data is not recorded every year. The results of the study proposed reliable and unreliable sources for the policy makers to influence fiscal affairs.

Kaplanoglou & Rapanos, (2013) aimed to highlight the short comings of the Greek tax system that are the reason for low tax revenues, high budget deficit and sovereign foreign debt. The analysis showed that the tax base contains very little proportion of the personal and business incomes. The tax system is highly supportive for the existence of shadow economy and in turn massive tax evasion. The results suggest that simplifying tax laws, rationalizing fines and improving tax audits are not sufficient steps to increase tax revenues but to bring a long lasting improvement, trust on public institutions should be established to get the targeted results of a policy action.

Kwak, S. (2013) examined the volatility of state government revenues affected by different components of tax base. The main focus of the study is general sales tax and individual income tax. The results show that revenue volatility is significantly affected by how tax base composed and progressive income tax structure is likely to increase volatility of revenues. An inference is also drawn that the workers with high incomes are more likely to increase the volatility of the govt. tax revenues. The findings also suggest that demographic economic characteristics including age structure and income distribution are also supposed to have effects on revenue volatility. Hassett and Mathur, (2009) provides a brief overview of U.S. tax policy in relation to OECD countries. Data for other countries of the world is also analyzed at the same time and the comparison with U.S. is explained where it is thought to be meaningful. Corporate taxes, consumption taxes and share of income taxes in GDP is analyzed over time for the sample. Value added taxes and sales taxes are considered as the major proportion of consumption tax and hence their trends are observed for the comparison. The results showed that over the time, U.S. tax system became more progressive as compare to OECD countries but not because of U.S. govt. efforts, but because of OECD countries' less progressive tax system.

Salar et al. (2012) investigated the macroeconomic factors that enhance the revenue gap in Pakistan for 1975-2010. The results reported a long run relationship between the variables. The short run co-integration test reveals that

revenue gap is positively associated with GDP, imports, debt, unemployment rate and underground economy while it is negatively associated with inflation rate.

III. Data and Methodology

The underlying study tests the determinants of low tax revenue considering the main problems of the developing world especially in Pakistan. This study provides quite a different methodology to analyze the issue by considering both economic and socio-economic indicators. Some studies provided its link with the shadow economy while some are critically focus on the monetary side. The model presented in this study links tax to GDP ratio with trade openness, capital inflows, tax capacity, per capita income and corruption.

To find out the determinants of low taxes we have used Random coefficient model and the Arelleno-Bond estimation technique to show the overall relationship of the variables. The model is presented as follows;

$$\left(\frac{Tax}{GDP}\right)_{it} = \alpha_0 + \alpha_1 TO_{it} + \alpha_2 KI_{it} + \alpha_3 TB_{it} + \alpha_4 COR_{it} + \alpha_5 Y_{it} + \varepsilon_{it}$$

Here, *Tax/GDP* represents tax to GDP ratio, *TO* represents trade openness, *KI* represents capital inflows, *TB* tax base, *COR* represents corruption and *Y* represents log of per capita income that is also used in literature (see, for example, Siddique and Majeed, 2015; Siddique et al., 2016). As discussed in previous section, tax to GDP ratio has been high for developed countries while it is too low for developing countries.

Trade openness is measured as the share of GDP, capital inflow is measured as the sum of foreign debt and foreign aid inflow. Per-capita income is considered as the representative of the overall wellbeing of the individuals. For this purpose, per capita GDP (at constant 2005 US$) and its natural log is used. The result with log of the variable is better understandable and interpretable as well, (Ghura, D. 1998; Hinrich, H. 1965; Tanzi, V. 1987). Chelliah, R. (1971) used GDP as a measure of development and wellbeing of the individuals. Here, the idea is reproduced using per capita income thinking as a better representative of the wellbeing of the individuals. The data is taken for 27 countries for 2000-2014 from WDI for all variables except corruption index which is taken from (ICRG). The summary statistics is given in Table 1 for all variables used in or analysis, showing a minimum tax to GDP ratio of 3.46 and a maximum of 35.78, trade openness has a very high standard deviation showing that across the groups, trade barriers and restrictions are much varying. Some countries have opened their borders for trade while some are still bound to the trade barriers.

Table 1: Descriptive Summary

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Tax/gdp	405	14.02353	5.387838	3.46	35.78
TO	405	92.34477	70.298	15.84	444.1
KI	405	64.48444	42.48429	8.38	301.37
TB	405	69.4084	10.16704	0	86.76
COR	405	-0.02692	10.1670	-1.45	2.5
Y	405	5986.587	11050.7	118.64	49554.91

IV. Results and Discussion

Random Coefficient Model: we have applied Chow-pool ability test that follows F distribution to check the pool-ability of data. The test results are significant so H_0 is rejected that is "data is pool able". In the light of this result, random coefficient model is used to test the model and coefficients for each country are recorded. Our results of the estimation are matched with the theory except the one variable corruption that is insignificant for most of the countries. The complete representation of results is presented in Table 2 in the appendix. For trade openness, capital inflow and per capita income, most of the countries show positive relation with tax to GDP ratio and for most of the countries tested, it is highly significant. While tax base shows mixed results for different cross sections.

Arelleno-Bond Model: It was surprising to reject the null hypothesis as data is pooled in several studies, for example, Tanzi, V. (1987) and Tait et al. (1979) have used pooled regression model for 47 countries and 63 countries data taking more or less same variables. In the light of literature and past studies, data analyzed in this study is also pooled and it is regressed by using Arellano-Bond model. The results show all the variables highly significant except corruption.

It is supposed that the data is free from the time series problems like autocorrelation as the number of time periods are less than number of cross sections. To remove the cross sectional problems like heteroskedasticity. The robust results for the model also support our estimation results. The p-vale of Arelleno bond estimation for AR(2) is 0.255 that is also considered good. As if the p-value is less than 0.1 we may be threat of autocorrelation in the model or if it exceeds 0.5 or 0.6 we may be threat for over flown of the model.

Validity of instruments is tested by Sargan test. The p-value for Sargan test 0.0000 that is highly significant showing the validity of instruments. The instruments used are tax/gdp and political staility for capital inflow.

Table 3: Results of Arelleno-Bond Model

Variables	Coefficient	p-value
TO	0.0392	0.092
KI	0.0355	0.094
TB	0.0864	0.104
COR	-0.5835	0.720
Y	4.534	0.002

Our results are consistent with the literature, only corruption has insignificant estimate that is not as it was expected. Although, its sign is according to what was expected but p-value is very high showing insignificant effect otherwise corruption was expected to have negative relation with tax to GDP ratio. Trade openness and capital inflow have the positive and significant impact on tax to GDP ratio. The coefficient 0.04 showing that a one percent change in trade and capital inflow causes a 4 percent change in tax to GDP ratio. Capital inflow has an indirect link with the tax to GDP ratio. As Jayasinghe, S. (2007), Khemraj and Pasha, (2010) and Ilyas and Siddiqi (2010) recorded, as foreign debt or aid increases, there is an increase in the rate of inflation that causes the real tax burden to increase and hence in real term the tax to GDP ratio. It is also said that inflation is negatively related to the intentions of people to pay tax. As inflation rises, people find more ways to evade tax and hence it is a hypothesis that with a rise in consumer price index, tax evasion rises resulting in a low tax to GDP ratio. The mechanism is beyond the scope of this study only the first link is targeted here in this study. Tax base and per capita income are both positively related to tax to GDP ratio. Per capita income is highly significant while tax base is less significant. Per capita income is supposed to be the measure of individual's overall wellbeing. As per capita income changes, tax to GDP ratio also changes with the expected sign.

V. Conclusions

The idea is that to see how the macro and socio economic variables affect tax to GDP ratio across different countries. For this purpose, 27 countries are chosen randomly some of them are from the high income while mostly from low income group. Tax revenues are not only to finance the expenditure of a government while they are linked with many other economic and socioeconomic variables that are also of great importance. In the underlying study, trade openness, capital inflow, tax base and corruption are linked with the tax to GDP ratio. The results revealed that tax to GDP ratio has strong link with these variables. If the government fails to balance its budget with internal sources, it will go to finance its needs with external sources by borrowing or by excessive trade barriers. The study also found that tax base is positively related to the tax to GDP ratio, as tax base widened, tax to GDP ratio increases. The study is tried to compare a tax to GDP ratio and different macroeconomic socioeconomic variables. The empirics clearly reflects that the efforts made to pull the tax to GDP ratio up are not sufficient. There is much to do for the betterment or the things will be worse. The results show that the countries who have opened up their borders for trade are getting more benefit in regard of tax to GDP ratio. The results of capital inflow and tax base also show that as the government put serious effort in regard of these fields, tax to GDP ratio can be increased by significant proportions.

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Appendix

Country	TO	KI	TB	COR	Y
China	**.0293822**	**-.054597**	**.3817935**	-.8987454	**3.766204**
India	.0595683	.0063241	**-.3647188**	1.61086	.110245
Brazil	**.3034409**	-.0259103	-.1224322	**2.063877**	.4952015
Indonesia	-.010274	**.0325651**	**.2922963**	**7.759707**	-4.414045
Pakistan	**.1940382**	**.1402323**	**-.1096639**	-.2740845	.3560507
Malaysia	**-.0821965**	**-.0488506**	-.0465049	2.402896	-15.1669
Canada	**.0851576**	**-.133874**	-.0251822	.8125295	**-24.50451**
Chile	**.1602551**	-.0221383	**-.2872567**	**4.050643**	**-7.685872**
Denmark	**.0943179**	**-.1019585**	-.0505646	-.5629608	**-23.61007**
Ethiopia	**.0162371**	**.021627**	-.0224471	3.518142	-2.325029
Georgia	**-.0928742**	**.0456005**	**.5049102**	**3.915054**	**20.9383**
Kazakhstan	-.0393124	-.0227622	-.1228733	**-7.948501**	**12.82741**
Jordan	**.1592234**	.010097	-.0556986	2.331212	-8.026924
Kyrgyzstan	**.0325253**	**-.0219336**	.0174284	-.5820573	1.659073
Maldives	**.046721**	-.0325161	-.0321771	-.0391259	-1.782312
Nepal	**.0723393**	.0014094	-.0571006	.4062364	**18.83239**
Nicaragua	**.0943996**	**-.0197794**	-.0593352	.981331	-3.098772
Paraguay	.0150861	.0078128	**.2187582**	**2.276296**	-1.803156
Philippines	**.0810054**	**-.1466032**	.0897007	**1.774392**	**-15.66582**

Singapore	**-.0144434**	**-.029873**	-.0146237	-.1637696	-1.196225
Srilanka	.0048023	**-.0822201**	-.0056737	1.247196	**-6.094373**
Uruguay	**.0646646**	.014075	.0746807	.2166618	**7.03013**
Egypt	**.0841432**	**-.0640495**	.1965273	2.22057	-1.422256
Belize	**-.0877525**	**.0471655**	**-.4656313**	**-3.776377**	3.325998
Bhutan	-.0230703	.0105544	.040705	-1.924124	3.42776
Bulgaria	**.0537586**	-.0023296	-.1540128	1.814197	**3.492357**
Congo	**.0900672**	-.0078322	-.0290384	2.800355	-1.170234

(Bold values show significant results)