

# Analysis of Revenue Potential and Revenue Effort in Developing Asian Countries

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## Abstract

This study analyzes fiscal performance across developing Asian countries over the period 1984 to 2010. The results indicate that per capita GDP, agriculture value addition, trade openness, debt and population growth are significant determinants of revenue to GDP ratio across countries. Among the institutional factors, control of corruption, law and order and bureaucracy quality has a significantly positive effect on revenue performance. The fiscal effort indices obtained for Asian countries show that while several ASEAN countries are performing well above their potential, some South Asian economies fall short of their revenue potential. An overall decline in revenue effort is found in nineties, however in eighties and again in twenties there is improvement in revenue performance. The results suggest that there is need of good policy measures such as broadening the tax base and improving the institutional quality to address this issue. The architect of revenue reforms must be country specific that requires broad investigation of the country's revenue capacity, revenue performance, and institutional structure.

**JEL Classification:** H20, E62, O23

**Keywords:** Revenue potential, fiscal effort, institution quality, Asian countries, panel data

## 1. Introduction

Countries around the world are increasingly recognizing that the effective revenue system is the most important factor for economic development. Factors effecting revenue potential measured as the revenue to GDP has been one of the most important issues that concerns to policy makers from last three decades. Many developing countries face difficulties in generating sufficient revenues for public expenditure. In some countries budget deficits and the unproductive use of public expenditures have narrow the vital investments in both human resources and basic infrastructure that are necessary for providing base for sustainable economic growth and development. Too

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much dependence on foreign financing may cause problems of debt sustainability; therefore developing countries will need to depend substantially on domestic revenue generation.

There is a large body of literature on tax revenue potential in developing countries (Bahl, 1971; Tanzi, 1987; Leuthold, 1991; and Stotsky and WoldeMariam, 1997; Gupta, 2007 among others). However, there is few studies that examine institutional and governance quality as a factor influencing tax collection and tax revenue potential. According to Tanzi and Davoodi (1997) and Gupta (2007) these factors are responsible for low tax collection in developing countries by allowing citizens inappropriate tax exemptions and enabling tax evasion due to bad tax administration. Therefore, a precondition for ensuring adequate revenue collection is legitimate and responsive institutions following the rule of law with control on corruption and having high quality bureaucracy to administer. Studies also confirm that that a strong political will to reform is required for successful reform process (Bird, 2004). Alm and Martinez-Vazquez (2003) suggest that tax records of countries are reflection of their political or societal institutions.

The present study analyzes the idea of taxable potential and tax effort by extending to measure (fiscal) revenue potential and (fiscal) revenue effort. Total fiscal revenue is sum of both tax and non-tax revenue collection consisting of cash receipts from taxes, social contributions, and non-tax sources such as fines, fees, rent, and income from property or sales.

The main aim of the present study is to empirically investigate the sources of resource mobilization for developing Asian countries for the period 1984 to 2010. The sample of the countries include: Pakistan, Bangladesh, India and Sri Lanka, Indonesia, Malaysia, Thailand,

China, Philippines, Singapore, China, Singapore and Vietnam as these countries have common characteristics of large and persistent as well as instable budget deficit. More specifically, the study look at the main determinants of revenues of the central government, and analyze the extent to which factors such as the structure of the economy, macroeconomic policy and institutions and the level of development explain their variation. The study assesses the revenue effort of the sample countries that is defined as an index of the ratio of the actual revenue collection to GDP and the predicted revenue capacity.

The resources available for fiscal policy is inadequate for south Asian countries in particular and developing countries in general and this will make difficult to meet all public expenditures and government can focus on specific expenditures due to is political pressure. (Jha, 2009). India has shown an upward trend in revenue to expenditure ratio overtime whereas Pakistan, Bangladesh and Sri Lanka have recorded a decline in this ratio. So public deficit in South Asian countries remains high for Pakistan and Sri Lanka and countries face considerable resource constraints on financing of the deficit that result from their expenditure in excess of revenues. India has shown good revenue performer among South Asian countries but has shown no progress in its performance between 2005 and 2008. Bangladesh's score enhanced after 2006 but remained still thereafter. The most disappointing performance has been by Pakistan among the South Asian countries, however Sri Lanka's performance has comparable to India's in 2005 and 2006 but then has again worsen. China has registered an increase in their revenue to GDP ratio from 5% in 1990 to 11% in 2011 whereas Singapore, Malaysia, Indonesia, Philippines and Thailand show a decline in this ratio during this period. Although China shows a rising trend compared to other countries but even then there is no significant difference in revenue to GDP ratio of china and the rest of the countries in ASEAN region. In General falling tax/GDP ratios in these countries leads

to structurally unshakable fiscal deficits and necessitates investigating the main factors that may explain the variation in resource mobilization of developing Asian countries. Furthermore, quality of institution that creates economic stability and a move towards democratic regimes is also essential for the increasing the revenue collection capacity developing Asian region.

This paper undertakes panel data analysis to estimate revenue potential for a sample of developing Asian countries during 1984-2010 following the empirical methodology suggested by Bird, Vazquez, and Torgler (2004) and Gupta (2007). The estimation results are used as benchmarks to compare revenue potential and revenue effort in Asian countries. Revenue potential is defined as the estimated revenue to GDP with the regression, considering a country's specific macroeconomic, demographic, and institutional features. Revenue effort is an index of the actual revenue GDP and the predicted revenue potential.

The study adds to existing empirical literature by comparing fiscal capacity and fiscal effort among the developing countries of Asian region over longer period of time from 1984 to 2010 and for almost three decades separately: 1984 to 1990, 1991 to 2000 and 2001 to 2010. Second besides the traditional supply side determinants like GDP per capita, international trade, agricultural value added debt as a fraction of GDP the impact of quality of institution and policy variable on a country's revenue capacity are analyzed. The corruption index, the law and order and bureaucratic quality scores are used for this purpose. The indexes are obtained from the International Country Risk Guide (ICRG).

The study is organized as follows. Section 2 discusses the theoretical and empirical literature in this area. Methodological framework, data/sample and estimation technique are presented in section 3. The empirical results of regression analysis to estimate fiscal potential and index of fiscal effort analysis is presented in section 4 and the last section concludes the study.

## **2. Literature Review**

Regression Analysis focused on possible determinants of taxes are used in the literature to estimate taxable capacity and the tax effort of countries. Taxable capacity is defined as predicted tax-to-GDP ratio calculated by the estimated coefficients of a regression specification that takes into account the country specific characteristics (Gupta, 2007; Bird et al., 2008, Le, Moreno- Dodson, and Rojchaichaninthon, 2008). Tax effort is defined as an index of the ratio of the share of the actual collection to GDP and the predicted taxable capacity. A high tax effort points to a situation when a tax effort index is above 1, entailing that the country optimally uses its tax base to augment tax revenues (Stotsky, et al., 1997). Likewise, a low tax effort means that tax effort index is below 1, implying that the country may have potential to increase tax revenues.

Several studies show that variables such as per capita GDP, the sector wise composition of output, the degree of trade and financial openness, the ratio of foreign aid to GDP, the ratio of overall debt to GDP, a measure for the informal economy, and institutional factors such as the degree of political stability and corruption plays an important role in determining revenue performance of any economy (Gupta, 2007; Bird et al., 2008, Le, et al, 2008). Lotz and Morss (1967) find that per capita income and trade share are important determinants of the tax share. Chelliah (1971) relates the tax share to explanatory variables such as mining share, non-mineral

export ratio and agriculture share. Chelliah (1971) and obtain similar results. In a related study covering developing countries, Tanzi (1992) finds that half of the variation in the tax ratio is explained by per capita income, import share, agriculture share and foreign debt share.

The effect of trade liberalization is considered as important determinant that occurs primarily through reduction in tariffs, then one expects losses in tariff revenue, however revenue may increase provided trade liberalization occurs through tariffication of quotas, eliminations of exemptions, reduction in tariff peaks and improvement in customs procedure(Keen and Simone, 2004). Several studies find that there is a positive relationship between trade openness and the size of the government (Gupta, 2007; Bird et al., 2008 and, Le, et al. 2008). Rodrik (1998) also conclude that as societies seem to demand (and receive) an expanded role for the government in providing social insurance in more open economies subject to external risks (

The degree of external indebtedness of a country is also examined as factor that affects revenue performance of an economy (Gupta, 2007 and other studies). For generating necessary foreign exchange to service the debt, a country may choose to reduce imports that lead to lower import tax otherwise the country may choose to increase import tariffs or other taxes to generate a primary budget surplus for debt servicing. The composition of aid has an important effect on revenue performance,for example, concessional loans are associated with higher domestic revenue mobilization, while grants have the opposite affect(Gupta et al., 2004).

Studies such as Chelliah, Baas and Kelly (1975) and Tait, Grätz and Eichengreen (1979), update Recently, some studies have explored the importance of institutional factors in determining revenue performance. For example, Bird, Martinez-Vasquez and Torgler (2004) find factors such

as corruption, rule of law, entry regulations play key roles. Several regional studies have looked into quality of institution and governance as determinants of resource mobilization. Leuthold (1991) uses panel data to find a positive impact from trade share and Stotsky and WoldeMariam (1997) find that both agriculture and mining share are negatively related to the tax ratio, while export share and per capita income have a positive effect.

Ghura (1998) concludes that the tax ratio rises with income and degree of openness, and with the share of agriculture in GDP. He also finds that other factors like corruption, structural reforms and human capital development affect the tax ratio. Most studies find that per capita GDP and degree of openness is positively related to revenue performance, but a higher agriculture share lowers it. Studies such as Tanzi (1992) and Eltony (2002) found that foreign debt is positively related to resource mobilization.

The present study provides comparison of fiscal capacity and fiscal effort among the developing countries of Asian region. This study checks the robustness of quality of institutions and macroeconomic policy variables in determining the fiscal performance of countries in this region over a long period of time 1984 to 2010 that is further divided into three sub samples 1984 to 1990, 1991 to 2000 and 2001 to 2010.

### **3. Methodology and Data**

The present study analyzes revenue performance by estimating revenue potential and calculating revenue effort index for developing Asian countries over the period of 1984 to 2010<sup>2</sup>. The

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<sup>2</sup>Revenue potential refers to the predicted revenue to GDP ratio that can be estimated with the regression, taking into account a country's specific macroeconomic, demographic, and institutional features. While lacking solid theoretical foundations, actual tax to GDP (likewise revenue to GDP) is one of the most commonly used measures for cross country

empirical methodology applied by Bird, Vazquez, and Torgler (2004) and Gupta (2007) is adopted to examine the potential revenue capacity of developing Asian Countries. Revenue (fiscal) potential is the predicted revenue to GDP ratio estimated from the regression based on the country specific characteristics and revenue (fiscal) effort is ratio between the actual collection to GDP and predicted revenue capacity (Bird et al 2004 and Le, et al., 2008)<sup>3</sup>. The empirical specification of the model that measures the revenue potential by estimating the determinants of revenue is expressed as:

$$\text{Revenue/GDP} = F(\text{Economic, Demographic, Institutional, Policy})$$

More specifically the basic specification of the model takes the following form<sup>4</sup>:

$$\text{Revenue/GDP}_{it} = \alpha_i + \alpha_1 \text{GDPC}_{it} + \alpha_2 \text{Trade}_{it} + \alpha_3 \text{Debt}_{it} + \beta \text{Popg}_{it} + \gamma \text{Ins}_{it} + \delta \text{Inf}_{it} + \varepsilon_{it} \quad (1)$$

$$\text{Revenue/GDP}_{it} = \alpha + \alpha_1 \text{GDPC}_{it} + \alpha_2 \text{Trade}_{it} + \alpha_3 \text{Debt}_{it} + \beta \text{Popg}_{it} + \gamma \text{Ins}_{it} + \delta \text{Inf}_{it} + v_i + \varepsilon_{it} \quad (2)$$

Where revenue to GDP ratio for the country  $i$  for the period  $t$  which is function of economic variables, demographic, institutional / governance quality and policy variables, The vector of economic variables measures the structural characteristics of countries and it includes GDP per

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comparison of tax (fiscal) effort. The advantages of this measure are that it is easy to obtain and gives quick overview of revenue performance across countries. The problem is that, the measurement of the potential revenue capacity is based on, a priori, set of explanatory variables that determine the potential capacity of a country to collect revenue, but it does not reflect either the demand for higher public expenditures or the political willingness to collect revenue as pointed out by Bird (1978) and Toye (1978).

<sup>3</sup>A high fiscal effort is the case when a effort index is above 1, indicating that the country well utilizes its revenue base to increase revenues and a low fiscal effort is the case when a effort index is below 1 implying that the country may have relatively substantial potential to raise revenues (Stotsky, et al., 1997; Bird et al., 2004 and Le, et al., 2008). This index allows to compare country's revenue effort vis-à-vis that of its peers (Tanzi and Zee, 2000).

<sup>4</sup>The Fixed effect panel regression specification is given in equation (1) and random effect specification on equation (2) respectively.

capita, trade to GDP, external debt to GDP in the basic specification. The share of agriculture to GDP and share of manufacture to GDP<sup>5</sup> are also examined as the determinants of revenue potential of the Asian countries. The population growth is taken as demographic variables. The vector of institution includes the variables that capture institutions and quality of governance such as control of corruption, high bureaucracy quality and law and order scores<sup>6</sup>. The inflation rate is used as macroeconomic policy variable which effects the investment and income level of the country.

Income level, measured as GDP per capita, is used as a proxy for the level of a country's development, and it is expected to be positively related with the government's ability to collect revenues and the citizens' ability to pay revenue. Thus, it is expected that GDP per capita to have a positive and significant impact on fiscal revenue (Bahl, 1971; Fox et. al, 2005; Piancastelli, 2001; Gupta, 2007; Bird et al., 2004 and Le, et al, 2008). Trade tax revenue being a major source of tax revenue in developing countries (Rodrik, 1998; Piancastelli, 2001; Norregaard and Khan, 2007; Gupta, 2007; Aizenman and JinJarak, 2009) lowers the overall tax-to-GDP ratio in post trade liberalization era under the Uruguay Round of World Trade Organization. The effect of trade liberalization may be ambiguous due to two opposite effects on taxes. On the one hand, it may have a negative impact on taxes and fiscal revenue as higher trade openness is expected to lower taxes collected on imports and export, On the other hand, given that higher trade openness is leads to higher economic growth rates, open economies to grow faster; and as a result, more taxes can be collected with increasing this tax base. It is expected that the second effect outweigh in case of Asian countries and trade openness has a positive impact on taxes and total fiscal

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<sup>5</sup>The sector-wise composition of GDP also affects revenue collection capacity because in some sectors of the economy it is easy to impose tax than others. For example, the agriculture sector is considered as difficult to tax, especially if there are a large number of subsistence farmers. On the other hand, manufacturing sector consisting of a few large firms can generate large tax. These components of GDP are added one by one to avoid multicollinearity.

<sup>6</sup> Due to high correlation between institutional variables one variable is included in the specification at a time.

revenue. Further, Gupta (2007) documents that if this liberalization is undertaken through reduction in tariffs then it is expected that tariff revenue will be reduced. On the other hand, Keen and Simone (2004) argue revenue may increase if trade liberalization takes place through tariffication of quotas, eliminations of exemptions, reduction in tariff peaks and improvement in customs procedure. Rodrik (1998) also comes to conclusion that there is a positive association between trade openness and the government consumption, as people demand (and receive) increasing amount of public goods in more open economies subject to external risks.

The revenue potential is affected by the debt of a country as to generate the necessary foreign exchange to service the debt, a country may choose to reduce imports and import taxes will be lower. Alternatively, the policy may be to increase import tariffs or other taxes in order to register budget surplus to service the debt (Gupta, 2007). Therefore it is expected that level of indebtedness of the country is positively associated with revenue potential of the country.

The recent empirical literature finds non-traditional variables like institutional and governance quality as important determinants of revenue potential for developing countries. The institutional and governance factors impact revenue collection potential by influencing tax evasion, inappropriate revenue exemptions, and weak revenue collection administration (Tanzi and Davoodi, 1997). Bird et al. (2004) argue that any successful tax reform should be rooted in a strong political will to reform, and Alm and Martinez-Vazquez (2003) document that a country's tax record is reflection of its political or societal institutions. Bird, Martinez-Vazquez, and Torgler (2004) conclude that rule of law and control of corruption is necessary prerequisite for a more satisfactory revenue effort. For example poor law and order conditions in the economy

induce people to avoid the tax and non-tax payments. If corruption is high in an economy, large part of business community would prefer to work underground by paying bribes to avoiding high revenue payments. If societies have feelings that their interests are well represented at government level and they are satisfied with quality and quantity of public goods like health, education etc., they are willingness to pay revenues. To evaluate the impact of these intuitional variables on revenue performance three governance indicators computed by International Country Risk Data Guide are included; corruption index, bureaucracy quality and law and order scores. It is expected that control of corruption, high quality of bureaucracy and strong law and order enforcement are positively associated with the revenue potential of developing Asian countries.

The inflation is policy variable that is included to measure the quality of a country's macroeconomic policies. It allows capturing direct effect of inflation on revenue collection through its impact on consumption and investment, and subsequently on their related tax categories. It is expected that inflation has negative effect on revenue collection capacity.

### **3.1 Data and Sample**

The study used annual data on economic, political and institutional variables, from 1984 to 2010. The source of economic data is international financial statistics and world development Indicators. Institutional variables are obtained from International Country Risk Data Guide (ICRG). Economic variables revealing structural distinctiveness of the countries include real GDP per capita, agriculture value addition to GDP, trade to GDP, debt to GDP. The GDP per capita is expected to have positive impact on revenue collection capacity of a country with level

of income and citizens also demand more public goods and services. On the other hand large agriculture sector is difficult to tax because of large share of subsistence and politically infeasibility, and reduction in need of public goods and services which are urban based. It is relative easier to tax foreign trade compared to domestic activities as goods enter and leave the country at specific places. Therefore it is expected that trade openness has a positive impact on revenue collection. Inflation is measured as percentage change in consumer price index and it is expected that inflation has negative impact on revenue collection capacity of the country.

The demographic variables include population growth and as the rate of population growth increases, the revenue collection system finds difficult to capture new revenue payers especially when revenue collection administration capacity is weak. Therefore, the population growth rate is expected to be negatively related to the revenue potential of a country. Inflation measures the quality of a country's macroeconomic policies. The quality of fiscal and monetary policies in terms of revenue is measured by Inflation rate as high level of inflation would reduce the revenue to GDP ratio due to negatively effecting consumption and investing capacity and thus decreasing tax revenue generated from these categories.

The quality of institutions captures various aspects of the governance of the public sector, such as control of corruption, rule of law; high bureaucracy quality and these factors are expected to be positively associated with revenue collection capacity of a country. A high value of institutional indicates a higher quality of institutions. The corruption index measures the extent of corruption by assigning a numerical value to a country. The index ranges from 1 to 6, where a high number means lower corruption. Similarly the law and order index also ranges from 1 to 6. The bureaucracy quality index is an alternative institutional indicator of governance and it ranges from 1 to 4. Following Tanzi and Davoodi (1997) in this analysis institutional variables

are used after rescaling the original ICRG corruption index, law and order index and bureaucracy quality indicator to a range of -6 (least corrupt or best bureaucratic quality and best law and order conditions) and -1 (most corrupt or worst bureaucratic quality and law and order conditions).

### **3.2 Estimation Technique**

The panel data estimation techniques fixed effect and random effect models and dynamic panel data model are used. The econometric issues related with these techniques are the presence of country specific fixed effects and endogeneity. To deal with these issues Arellono and Bond (1991) introduced the Generalized Method of Moments after first differencing the equation. Latter Blundell and Bond (1998) suggest efficiency can be increased by adding the original equation in the level to the system, if the first difference of the explanatory variables is uncorrelated with original effects. Lagged dependent and exogenous variables can be used as instrument variables. Multicollinearity is another problem which arises when two or more explanatory variables appeared to be highly correlated with each other and to resolve this problem the highly correlated explanatory variables are used in separate specifications.

## **4 Empirical Results**

The analysis begins with basic specification of the revenue model 1 and determinants include the log of per capita GDP, trade to GDP, debt in GDP, population growth and control of corruption and inflation. Generalized method of Moments of Blundell and Bond (1998) is used as estimation technique that allows to deal with country specific effects and any edogeneity that may be due to the correlation of the country specific effects and dependent variable. The result of

Hausman test indicates that fixed effects specifications best describes the data in almost all specifications. Later in model 2 and 3 bureaucracy quality and law and order score are included one by one. Then GDP per capita is replaced by agriculture value added to GDP in model 4, 5 and 6. The results of fixed effect models 1 to 6 are presented in Table 1.

The per capita GDP has significantly positive impact in basic specification of revenue potential model 1 suggesting that the capacity to collect and pay revenue increases with the level of development of sample countries. This result is consistent with earlier studies (Chelliah, 1971, Bahl 1971, Fox, et al. 2005, Gupta, 2007). The trade openness is positive and significant determinant of tax to GDP because trade-related taxes are easier to impose (Gupta, 2007). The result indicates that debt has a positive effect on revenue potential; Gupta (2007) finds that debt is negatively related with revenue performance. The population growth rate is negatively related to the revenue potential. Bird et al. (2004) also finds the inverse relationship between population growth and resource mobilization suggesting that as the rate of population growth increases, the tax system may lag behind in its ability to capture new taxpayers. Inflation has negative and significant impact on the revenue capacity of the sample countries. The negative relationship of inflation confirms that inflation detrimental impact revenue collection potential of countries and is consistent with the results reported by Agbeyegbe, Stotsky, and WoldeMariam (2004). The high inflation rate reduce the purchasing power of consumers and investing ability of consumer and therefore negatively impact the revenue collection.

The impact of institutional quality on revenue collection is positive and significant as expected as they are added one by one in model 1, 2 and 3. This is consistent with the findings of Tanzi and Davoodi (2000) and Bird, Martinez-Vazquez, and Torgler (2004) and Gupta (2007). These results support that quality of institution and governance increase the revenue capacity and this is

a direct channel for the impact of institutions on revenue collection. There is indirect impact that institutions have through shadow economic activity.

In model 4, 5 and 6 agriculture value added to GDP is replaced GDP per capita. The agriculture to GDP has negative and significant relationship with revenue potential of sample countries. The presence of large agriculture sector is considered administratively and politically difficult taxing agriculture and government rather wants to either provide tax exemptions or subsidies. This also reduces the demand for government services, since many public sector activities are urban based (Tanzi, 1992, Gupta, 2007). Most of the variables have expected relationship with revenue potential of Asian countries; however the effect of inflation and trade openness turns out to be insignificant. The trade openness has less role in revenue generation in countries which are more agriculture may be due to fact that have a negative impact on taxes and fiscal revenue as higher trade openness is expected to lower taxes collected on imports and export that offsets the positive effect because of fact that higher trade openness leads to higher economic growth rates (Combes and Saadi-Sadeq, 2006)<sup>7</sup>

**Table 1: Determinants of Revenue Potential in Developing Asian Countries: 1984 2010**

	Mod1	Mod2	Mod3	Mod4	Mod5	Mod6
Constant	0.12* (5.4)	0.19* (7.22)	0.14* (6.35)	0.14* (3.4)	0.16* (4.6)	0.18* (5.8)
GDP per capita	0.08* (3.92)	0.07* (3.5)	0.07* (1.95)			
Agriculture Value Addition to GDP				-0.05* (-3.3)	-0.04* (-2.04)	-0.02* (-1.6)
Trade/GDP	0.05* (2.26)	0.06* (3.10)	0.04* (3.85)	0.04 (0.7)	0.03 (0.09)	0.08 (0.56)
Debt/GDP	0.48* (4.14)	0.35* (9.90)	0.20* (9.90)	0.39* (7.3)	0.41* (7.8)	0.42* (7.7)

<sup>7</sup> Appendix Tables A2 and A3 reports the results of models 1 to 12 for sub periods: 1984 to 1990, 1991 to 2000 and 2001 to 2010. The results of regression analysis are almost the same for the sub periods as well.

Population Growth	-0.04* (-2.32)	-0.03* (-5.44)	-0.05* (-2.98)	-0.03* (-4.4)	-0.02* (-4.2)	-0.03* (-3.89)
Inflation	-0.02** (-1.94)	-0.01** (-1.89)	-0.01** (-1.85)	-0.01 (-0.44)	-0.01 (-0.57)	0.01 (-0.66)
Control of Corruption	0.01* (3.98)			0.02* (3.9)		
High quality Bureaucracy		0.01* (2.79)			0.01* (2.1)	
Best Law and Order conditions			0.008* (2.95)			0.009* (1.8)
Hausman Test(p value)	(0.27)	(0.21)	(0.11)	(0.58)	(0.31)	(0.44)
R <sup>2</sup>	0.37	0.35	0.35	0.35	0.35	0.35

Note: The \* indicates significance at 1%, \*\* at 5% and \*\*\* at 10% level. The Hausman Test supports fixed effect model. The GMM is estimation technique and lag exogenous are used as instruments.

Table 2 reports the results from the dynamic panel models. The results of Models 7, 8 and 9 confirm that lagged revenue to GDP is a strong and significant predictor of current revenue potential. Gupta (2007) also finds random walk type of result in cross country analysis in this regard. The result indicates that per capita GDP, debt to GDP are significant predictor of revenue potential. However, the impact of per capita GDP is substantially smaller in the dynamic specification. The impact of both agriculture value added to GDP and population growth are negative as expected in model 10, 11 and 12 but impacts are marginally smaller in the dynamic specification. The indebtedness of country has positive significant affect the revenue potential in all six models. The trade openness and inflation are no more significant determinants of revenue potential of sample countries.

This above panel regression provide a simple empirical analysis of the predicted values of the revenue to GDP obtained through equation 1 that measure the revenue potential of Asian countries. The ratio of the actual to predicted revenue is calculated to measure the level of revenue effort of sample Asian countries (Bird et al, 2004 and Gupta, 2007)

**Table2:Determinants of Revenue Potential/Capacity in Developing Asian Countries: Dynamic Panel Model**

	Mod7	Mod8	Mod9	Mod10	Mod11	Mod12
Constant	0.05 (3.6)	0.06 (3.76)	0.05 (3.49)	0.05 (3.5)	0.05 (3.1)	0.04 (2.05)
Lag Revenue/GDP	0.72 (17.7)	0.74 (17.01)	0.72 (17.4)	0.68 (11.6)	0.69 (12.9)	0.68 (12.8)
GDP per capita	0.03 (1.84)	0.04 (1.89)	0.03 (1.85)			
Agriculture Value Addition to GDP				-0.03** (-1.88)	-0.02** (-1.90)	-0.01** (-1.92)
Trade to GDP	0.005 (1.13)	0.006 (1.38)	0.004 (1.03)	0.01 (0.20)	-0.005 (-0.08)	0.008 (0.12)
Debt/GDP	0.07* (5.37)	0.07* (5.36)	0.07* (5.29)	0.07* (3.47)	0.07* (3.3)	0.08* (3.6)
Population Growth	-0.02* (-2.33)	-0.02** (-1.93)	-0.02* (-2.34)	-0.03** (-1.85)	-0.03* (-1.97)	-0.03* (-1.94)
Inflation	-0.05 (-0.76)	-0.06 (-0.83)	-0.03 (-0.55)	-0.01 (-0.32)	-0.01 (-0.84)	0.01 (-0.68)
Control of Corruption	0.01* (2.31)			0.01* (2.44)		
High quality Bureaucracy		0.02** (1.95)			0.007* (2.23)	
Best Law and Order conditions			0.02* (2.33)			0.02* (2.05)
Hausman Test (p value)	(0.42)	(0.35)	(0.44)	(0.15)	(0.14)	(0.19)
R <sup>2</sup>	0.73	0.71	0.70	0.72	0.70	0.70

Note: The \* indicates significance at 1%, \*\* at 5% and \*\*\* at 10% level. The Hausman Test supports fixed effect model. The GMM is estimation technique and lag exogenous are used as instruments.

### Tax Effort Analysis

The above analysis has focused on finding the main factors that affect revenue potential in a sample of developing Asian countries. However, this does not tell whether a country could not, if it wanted, attain higher revenue potential (Chelliah 1971; Chelliah et. al. 1975 and Gupta, 2007). Different countries have different potential to raise revenues that must be taken into consideration while making cross-country revenue comparisons (Gupta, 2007, Bird, et al (2004) and Le et al 2008). The selection of regression results to estimate the predicted values of revenue

ratios are made on the base of their significance and economic rationale in this analysis (Teera and Hudson, 2004). Several studies have followed the same approach to measure revenue effort across countries (Gupta, 2007, Bird, et al., 2004). The predicted values of the revenue ratio is obtained through model 1 and 4, thus measure the country's revenue potential, while the ratio of the actual to predicted revenue is calculated for the level of revenue effort. Thus, a country that lies on the regression line have a revenue effort index equal to 1, and countries that have actual revenue effort above predicted revenue performance have a revenue effort index higher than one, in reverse case revenue effort index is less than 1. The results of revenue effort are presented in Table 3 for sample countries. Malaysia, Indonesia, Thailand, Philippines and Singapore have exhibited significant revenue performance compared to other countries, having revenue effort index greater than 1. These countries have probably largely used their revenue potential. On the other hand, countries like Pakistan, Bangladesh and Sri Lanka have revenue effort indices well below 1 which suggests that they have yet to achieve their full revenue potential, as they are constrained by low per capita GDP, a dominant agriculture sector

**Table 3: Revenue Effort Index for Developing Asian Countries**

	Model1: GDP per Capita				Model4: Agriculture Value Added to GDP			
	1984-90	1991-00	2001-10	1998-10	1984-90	1991-00	2001-10	1984 10
India	0.97	0.94	1.03	0.98	0.96	0.87	1.04	0.98
Pakistan	0.96	0.90	0.85	0.92	1.00	0.93	0.85	0.91
Bangladesh	0.84	0.80	0.82	0.85	0.84	0.80	0.82	0.83
Sri Lanka	1.05	0.89	0.84	0.87	0.88	0.84	0.90	0.89
Malaysia	1.00	0.92	1.02	0.91	1.00	0.85	1.02	0.88
Indonesia	0.85	0.93	1.11	1.07	0.85	0.93	1.04	1.01
Thailand	1.11	1.17	1.01	1.26	1.00	0.92	1.05	1.05
Philippines	0.95	1.03	0.94	1.29	0.89	0.88	0.94	0.99
China	1.12	0.83	1.11	1.01	1.12	0.89	1.11	1.03
Singapore	1.06	1.37	1.31	1.40	1.05	1.14	1.11	1.15
Vietnam	0.84	1.00	0.90	0.87	0.82	0.84	0.99	0.90

## 5 Conclusion

The development of revenue effort index that relates the actual revenues of a country to its estimated revenue capacity provide an appealing measure that considers country specific fiscal, demographic, and institutional characteristics. This study analyzes revenue performance across developing Asian countries over the period 1984 to 2010 and also for the sub periods 1984 to 1990, 1991 to 2000 and 2001 to 2010. The results indicate that per capita GDP, share of agriculture in GDP and foreign debt are statistically significant and strong determinants of revenue performance in almost all specifications of the model. The trade openness and inflation are also having impact on revenue performance in some specifications. Among the institutional factors, control of corruption and high bureaucracy quality and improved law and order conditions have a significantly positive effect on revenue performance in all model specifications. The results confirm that countries that depend on agriculture value addition tend to have poorer revenue performance. The analysis highlights that revenue performance depends on level of development of country, its institutional and governance quality and to macroeconomic policy and political will for reforms. This analysis can be considered complimentary providing a broader picture of revenue performance but detailed analysis of a country's revenue system that takes account of the country's overall fiscal policy, public expenditures needs and the overall level of development in Asian region is needed for future research. The results imply that architect of revenue reforms must be country specific that requires broad investigation of the country's revenue capacity, revenue performance, and institutional structure.

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## Appendix

**Table A2: Determinants of Revenue Potential in Developing Asian Countries**

	1984-1990			1991-2000			2001-2010		
	Mod 1	Mod 2	Mod 3	Mod 1	Mod 2	Mod 3	Mod 1	Mod 2	Mod 3
Constant	0.21* (6.39)	0.22* (7.2)	0.23* (6.2)	0.11* (4.11)	0.10* (4.11)	0.10* (3.9)	0.13* (2.34)	0.16* (2.42)	0.06* (0.83)
GDP per capita	0.02* (3.8)	0.02* (5.02)	0.02* (4.95)	0.005* (3.12)	0.001* (2.37)	0.001* (3.31)	0.04* (2.04)	0.001* (2.17)	0.01* (2.81)
Trade/GDP	0.02* (2.88)	-0.02* (2.86)	0.03* (2.02)	0.06* (7.54)	0.05* (7.7)	0.05 (7.7)	0.01* (2.53)	0.02* (3.01)	0.01* (3.12)
Debt/GDP	0.18 (4.44)	0.19 (4.8)	0.188 (4.23)	0.10 (4.2)	0.10 (3.84)	0.10 (3.89)	0.186 (4.35)	0.17 (3.99)	0.17 (4.26)
Population Growth	-0.07	-0.01*	0.005*	-0.005*	-0.06*	-0.006*	-0.01*	-0.01*	-0.01*

	(-2.01)	(-2.00)	(3.15)	(-2.12)	(-2.4)	(-2.5)	(-3.2)	(-2.60)	(-3.17)
Inflation	-0.002 (-1.46)	-0.001 (-1.11)	-0.001 (-0.87)	-0.002 (-2.36)	-0.002 (-2.62)	-0.002 (-2.4)	0.001 (0.15)	0.001 (0.74)	0.002 (1.02)
Control of Corruption	0.012* (3.25)			0.005 (2.11)			0.01** (1.96)		
High quality Bureaucracy		0.013* (3.87)			0.002* (2.64)			0.01* (2.51)	
Law and Order			0.008			0.01* (2.28)			0.014* (2.78)
Hausman Test (p value)	(0.43)	(0.39)	(0.28)	(0.13)	(0.12)	(0.14)	(0.09)	(0.76)	(0.67)
R <sup>2</sup>	0.70	0.72	0.66	0.56	0.55	0.55	0.32	0.31	0.37

Note: The \* indicates significance at 1%, \*\* at 5% and \*\*\* at 10% level. The Hausman Test supports fixed effect model. The GMM is estimation technique and lag exogenous are used as instruments.

**Table A3: Determinants of Revenue Potential in Developing Asian Countries**

	1984-1990			1991-2000			2001-2010		
	Mod 1	Mod 2	Mod 3	Mod 1	Mod 2	Mod 3	Mod 1	Mod 2	Mod 3
Constant	0.01 (0.67)	-0.01 (-0.5)	-0.03 (-0.85)	0.12* (4.8)	0.12* (4.3)	0.12* (3.33)	0.24* (5.10)	0.29* (5.35)	0.23* (3.93)
Agriculture Value Addition to GDP	-0.02* (-3.07)	-0.03* (-3.7)	-0.03* (3.10)	-0.02* (-2.2)	-0.04* (-2.43)	-0.03 (-0.35)	-0.05 (-2.5)	-0.05 (-2.95)	-0.05 (-2.44)
Trade/GDP	0.04* (2.4)	0.08* (5.6)	0.06* (3.8)	0.06* (5.3)	0.05* (5.07)	0.05* (4.91)	0.03** (1.9)	0.02** (1.8)	0.02* (1.85)
Debt/GDP	0.16* (3.9)	0.17* (4.1)	0.15* (3.17)	0.10* (4.7)	0.10* (4.39)	0.10* (4.39)	0.16* (4.2)	0.15* (3.8)	0.16* (4.0)
Population Growth	-0.01* (-2.13)	-0.01* (-2.22)	-0.01* (-2.83)	-0.01** (-1.86)	-0.01* (-1.96)	0.01* (-2.15)	-0.01* (-2.7)	-0.01* (-2.08)	-0.01* (-2.6)
Inflation	-0.02* (-1.89)	-0.02* (-1.89)	-0.01* (-2.77)	-0.02* (-2.42)	-0.03* (-2.77)	-0.02* (-2.6)	-0.01* (-2.97)	-0.02* (-2.15)	-0.02* (-2.35)
Control of Corruption	0.01* (5.31)			0.05* (2.14)			0.01* (2.05)		
High quality Bureaucracy		0.02* (5.27)			0.03* (2.70)	0.01* (2.37)		0.01* (2.87)	
Law and Order			0.01* (3.02)						0.05* (2.64)
Hausman Test (p value)	(0.18)	(0.11)	(0.21)	(0.16)	(0.13)	(0.14)	(0.09)	(0.24)	(0.08)
R <sup>2</sup>	0.68	0.68	0.31	0.56	0.55	0.55	0.37	0.37	0.37

Note: The \* indicates significance at 1%, \*\* at 5% and \*\*\* at 10% level. The Hausman Test supports fixed effect model. The GMM is estimation technique and lag exogenous are used as instruments.