Determinants of Tax Revenue:
Does Liberalization Boost or Decline It?

Mansour Zarra-Nezhad[1], Majid Sheikh Ansari[2] and Mahvash Moradi[3]

Trade liberalization due to its improving role has been at the center of economies in recent years. Against public finances of many developing and emerging market countries, it still acts as develop alternative source of revenue. Using a panel of 83 countries, over 1990–2012, we perform Generalized Method of Moment regression to test the hypothesis whether trade liberalization boosts tax revenue. Also, this paper assesses the statistical significance number of potential determinants of tax revenue as a share of GDP. The results of dynamic panel estimation show more trade liberalization is accompanied by more tax revenue. Among the variables that exert a statistically significant influence on tax revenue are the following ones: GDP growth rate, share of agriculture over GDP, official exchange rate, urbanization and democracy. Therefore, the study concludes that there is the need for appropriate macroeconomic policy to enhance the trade liberalization in order to accelerate government revenue.

1. Introduction

Trade liberalization is a hotly debated issue in recent years in economies. However, the early classical theorists; David Ricardo and Eli Heckscher have long pointed out the possible gains from trade. They suggest that these gains result from specialization in production due to international trade. After that, the related issues of trade liberalization became focal point of interests for many authors. As Longoni (2009) stated, one of the most widely accepted theories in economics claims that there exists a positive relationship between a higher degree of openness to international trade and economic growth. As a consequence,

---

[1] Department of Economics, Shahid Chamran University, Ahvaz, Iran
[2] Department of Economics, Yazd University, Yazd, Iran
[3] Department of Economics, Shahid Chamran University, Ahvaz, Iran
E-mail : moradi.mahvash67@gmail.com

a trade liberalization reform is largely considered as a growth-enhancing strategy because of its positive effect on the promotion of efficiency, the improvement in international competition and the expansion of the trade volume. Agbeyegbe *et al.,* (2004) specified that trade liberalization has frequently been the centerpiece of an economic development strategy. Trade liberalization often entails a reduction and unification of tariffs and relaxation of quantitative barriers, and may be accompanied by domestic tax reform. Also, Pupongsak (2009) claimed trade liberalization has outstanding advantage which induces most countries to walk toward free trade regime. Globalization is a phenomenon which involves increases in the flows of trade, capital, information and technology, mobility of labor across borders, substantial expansion in world production, and consequently, a rise in world economic welfare. Trade liberalization is normally associated with the reduction, removal and elimination of taxes on goods and services (including tariffs and import duties), and other trade barriers such as quotas on imports, subsidies, and non-tariff barriers to trade. There are many examples which strongly support the notion that openness to international trade brings more benefits to the country, for instance Harrison (1996), Harrison and Hanson (1999), Rodríguez and Rodrik (2000), which suggest the positive association between trade liberalization and economic growth. In addition, World Bank (2002) reported that almost half of the developing countries which have lowered their average tariffs by about 30 percentage points, experienced growth of per capita income by 4 percent in 1990. Thus, over the past few decades, liberalizing the external trade regime has been one of the central and most visible elements of many less developed and developing countries to achieve accelerated economic growth.

Against the advantages a country can achieve from liberalization process, it has been questioned "Whether all countries have benefited from the gains of trade liberalization?" or "Whether countries which rely heavily on tax revenue as a source of government revenue benefit from liberalization?" The relationship between trade liberalization and tax revenue is therefore an issue of great practical importance, since; trade liberalization is mainly thought to be linked to tax revenue through its effect on international trade tax revenue. On one hand, it has been argued that trade liberalization is likely to lead to a considerable decrease in international trade tax revenue through the reduction of tariffs, especially in developing countries. The fiscal drawback is serious

if a country is highly dependent on international trade tax. In this way, economists recommend that, in order to mitigate the loss of international trade tax revenue, one strategy is to boost both domestic direct and indirect taxes, mainly increasing revenue from goods and services tax, by implementing domestic tax reform. Leading revenue sources from international trade tax to broad-based domestic taxes, economists believe that the negative impact of trade liberalization can be offset or reduced. As Greenaway and Milner (1993) found that there is a wide range of possible revenue outcomes from trade liberalization, depending on initial conditions, the components of the reform package, the effects of changes in tariff rates, changes in the import base, and changes in the exchange rate. On the other hand, in the last several decades, there have been ambitious efforts in much of the countries to liberalize trade, because they recognize that trade reform is vital for economic development, poverty reduction, more efficient allocation of resources, enhanced productivity, and higher economic growth. The increasing trend of liberalization around the world is illustrated in Figure 1.

Figure 1: Trend of Liberalization around World
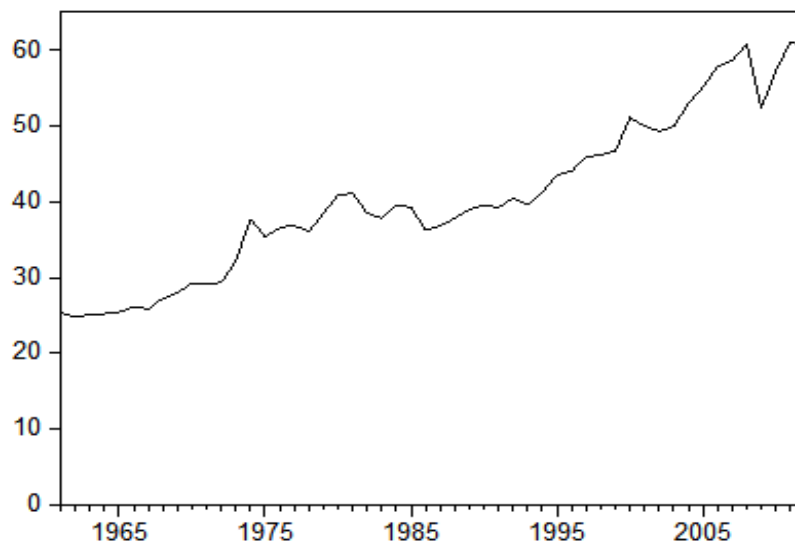
Source: Own calculation

As discussed earlier, the results around tax revenue and trade liberalization did not converge to a global conclusion. All in all, in this paper we aim at scrutinizing the effect of trade liberalization on tax

revenue across a selected group of countries during the period of 1990-2012. The reminder of this paper is as follow: Section 2 offers a brief literature review. Section 3 presents theoretical relation between liberalization and revenue. Section 4 contains econometric procedure and results. Finally, section 5 concludes and suggests policy recommendations.

2. Literature Review

Several studies have been done on trade liberalization as an area that deserves attention in international trade. In this part, we aim at introducing some relevant literature.

Agbeyegbe, *et al.,* (2004) examined the linkages between trade liberalization, exchange rates, and tax revenue. Using a panel of 22 countries in Sub-Saharan Africa, over 1980–1996, they performed Generalized Method of Moment regressions to test this relationship. They found evidence that the relationship between trade liberalization and tax revenue is sensitive to the measure used to proxy trade liberalization, but that, in general, trade liberalization is not strongly linked to aggregate tax revenue or its components—though with one measure, it is linked to higher income tax revenue. Currency appreciation and higher inflation showed some linkage to lower tax revenues or its components.

Baunsgaard and Keen (2005) in a paper have focused on the simple question: Over the last 25 years, have countries actually managed to offset reductions in trade tax revenues due to liberalization by increasing their domestic tax revenues? Based on results, for high-income countries, the answer was clearly 'yes.' For middle-income countries, there was also evidence of significant recovery: there were strong signs that this had been in the order of 45–60 cents of additional domestic tax revenue for each dollar of trade tax revenue, with apparently full recovery when separately identifying the episodes in which trade tax revenues fell. For low-income countries, however, recovery had been far from complete. At best, they had on average recovered no more than around 30 cents of each lost dollar.

Gupta (2007) investigated revenue performance of a large set of developing countries over the past 25 years. He found that several

structural factors like per capita GDP, share of agriculture in GDP and trade openness are statistically significant and strong determinants of revenue performance. The results indicated that although foreign aid improved revenue performance significantly, debt did not. Among the institutional factors, corruption had a significantly negative effect on revenue performance. Political and economic stability also affected revenue performance, but only across certain specifications.

Longoni (2009) empirically investigated the effect of trade liberalization on trade tax revenues applying panel-data methods to a large sample of African countries from the period 1970-2000. He found that there exists a large tradeoff between a greater degree of openness to international trade and the revenue collected from import and export taxation. Moreover, he also found that the relationship between trade taxes and trade tax revenues is nonlinear, giving credit to the existence of a Laffer effect.

Dioda (2012) in a study aimed at investigating the structural or long-term determinants of tax revenue by applying standard models to the case of Latin America and the Caribbean. Through panel econometric methodologies, the paper assesses the statistical significance of a number of potential determinants of tax revenue as a share of GDP, using data from 32 Latin American countries over the period 1990-2009. The results indicate that, among the variables that exert a statistically significant influence on tax revenue are the following ones: civil liberties, female labor force participation, the age composition of the population, the degree of political stability, the level of education, the population density as well as the size of the shadow economy. In that year, a study by Nwosa *et al.,* (2012) examined the relative contribution of trade liberalization on trade tax revenue in Nigeria for the period 1970 to 2009. The findings of the study showed that trade liberalization, public debt, trade openness, gross domestic product and labor force affected positively on trade tax revenue while exchange rate had negative effect. The Wald test showed that labor, public debt and exchange rate had significant influence on trade tax revenue while the Beta coefficient showed that trade liberalization policy was the major determinant of trade tax revenue in Nigeria. The study concluded that there is the need for appropriate macroeconomic policy to enhance the success of trade liberalization policy in Nigeria.

Muibi and Sinbo (2013) attempted to examine the most relevant macroeconomic policy variable that can serve as an anchor variable for stimulating tax revenue and boost the revenue profile of the government. The paper used secondary data from Nigeria economy for the period 1970 to 2011 and adopted the error correction mechanism to establish both the long run and short run relationships among the variables. The main finding of the empirical analysis was that tax revenue tends be significantly responsive to changes in income level, exchange rate and inflation rate. The income elasticity of tax showed that a unit percent increase in income level probably lead tax revenue increase by 0.63% in the immediate and 0.33% in the second year.

Epaphra (2014) studied the impact of trade liberalization proxied by reduction in collected tariff rate and other determinants of tax revenue that are associated with trade liberalization and reforms. In estimating the import duty revenue model, cointegration analysis and error correction modeling were applied over the 1979/80-2009/10. The study findings showed that trade liberalization is a potential source of fiscal instability in Tanzania because it relies heavily on revenue from international trade. Trade liberalization eventually results in reduced import duty revenue.

3. Tax Revenue-Trade Nexus

Countries collect taxes in different ways. It is therefore not possible to generalize about the effect of changes in trade liberalization and the surrounding macroeconomic environment on tax revenues without examining the structure of the different components of revenues. Tax systems encompass a wide variety of taxes, which can be divided into three general categories: taxes on income and profits, taxes on goods and services, and international trade taxes (Agbeyegbe *et al.,* 2004). To investigate the effect of trade liberalization on tax revenue the underlying analysis that are clearly defined in Adam *et al.,* (2001) is used. We examine a small open economy facing world prices of P_X and P_M for its exports and imports that produces and consumes a non-traded domestic good with price P_N. Capital stocks are sector-specific while labor, denoted L; moves between sectors to equalize real consumption wages. Public expenditure is financed through the three taxes: t on income; d on non-tradable production and consumption; and the tariff on

imports, φ. Relative prices are defined in terms of market rather than factor prices, hence the import real exchange rate is denoted:

$$Q = \frac{P_N}{P_M} = \frac{P_N}{P_M^* + \tau} \tag{1}$$

Where τ denotes the tariff and an increase in Q denotes an appreciation. The export real exchange rate is $Q_X = P_N/P_X$ from which it follows,

$$\frac{Q}{Q_X} = \frac{P_X}{P_M} = \frac{P_X}{P_M^* + \tau} = T\,(1 - \varphi) \tag{2}$$

Where $T = P_X/P_M^*$ is the (exogenously determined) small country's terms of trade in international markets, and $\varphi = \tau/(P_M^* + \tau)$ is the tariff expressed as a proportion of the tariff inclusive price.

Equilibrium holds when aggregate spending equals aggregate income at full employment and the trade balance is equal to the exogenous aid inflow (for simplicity we assume there are no private international capital movements or changes in reserves). Using revenue and expenditure functions (see Dixit and Norman, 1980), and denoting public and private expenditure functions and utility by lower- and upper-case letters respectively, we express this relationship as:

$$e\,(P_N,\,P_M,\,u) + E\,(P_N,\,P_M,\,U) = R\,(P_N,\,P_X;\,L) + P_M A \tag{3}$$

In which u, U and A denote public and private sector utility and aid measured in units of imports. There is no government production in this economy: the government simply consumes the imported and non-tradable goods, although its preferences are not necessarily the same as those of the private sector. For convenience, we normalize on the domestic price of imports (P_M) and re-express (3) as:

$$e\,(Q,\,1,\,u) + E\,(Q,1,\,U) = R\,(Q,\,T\,(1-\varphi);\,L) + A \tag{4}$$

By the properties of the revenue and expenditure functions, letting subscripts denote partial derivatives with respect to the relevant arguments, we can express the supply and compensated demand functions for non-traded goods as R_Q, e_Q and E_Q respectively, leading to market-clearing condition in the non-traded goods market:

$$e_Q (Q, 1, u) + E_Q (Q, 1, U) = R_Q (Q, T (1- \varphi); L) \qquad (5)$$

By Walras Law, (4) and (5) imply equilibrium in the tradable goods sector. GDP measured in imported goods is:

$$R= QR_Q + T (1- \varphi) R_T \qquad (6)$$

Where R_T represents the supply of tradable goods. Public expenditure is financed through a tax on private sector income (excluding net aid inflows), the domestic sales tax and the tariff on imports. With no changes in foreign reserves and aid as the only capital inflow then the tax base for tariff revenue can be expressed in terms of the capacity to import (i.e. total exports plus aid valued at domestic import prices). Finally, we allow for Tanzi effects so that the actual real revenue yield from each tax instrument is a (negative) function of the inflation rate, π. Tanzi effects are assumed to differ across the three taxes and are denoted $\alpha(\pi)$, $\beta(\pi)$, and $\gamma(\pi)$ respectively for income taxes, indirect taxes, and trade taxes. These Tanzi effects represent the only price non-homogeneity in the model. Thus, with a balanced government budget, we define the revenue/expenditure of the public sector as:

$$e (Q, 1, u) = t(1 - \alpha (\pi)) (QR_Q + T(1- \varphi)R_T) + d(1-\beta(\pi))QR_Q + \qquad (7)$$
$$\varphi(1- \gamma (\pi)) (T(1- \varphi)R_T + A)$$

Defining the revenue yield for each tax as Y_i for $i = t;\ d;$ and φ, we obtain:

$$Y_t = \frac{t(1-\alpha(\pi)) (QR_Q + T(1-\varphi)R_T)}{QR_Q + T(1-\varphi)R_T} Y_d = \frac{d(1-\beta(\pi))QR_Q}{QR_Q + T(1-\varphi)R_T} \qquad (8)$$
$$Y_\varphi = \frac{\varphi(1-\gamma(\pi))(T(1-\varphi)R_T+A)}{QR_Q+T(1-\varphi)R_T}$$

Totally differentiating these revenue yields, we get the following expressions for the evolution of the component tax yields, under the assumption that the tax rates are fixed at $t,\ d$ and φ. For convenience, we define the own- and cross-price elasticity of supply for tradable and non-tradable as:

$$\sigma_{QQ} = \frac{QR_{QQ}}{R_Q}, \sigma_{TT} = \frac{TR_{TT}}{R_T}, \sigma_{QT} = \frac{TR_{QT}}{R_Q}, and\ \sigma_{TQ} = \frac{QR_{TQ}}{R_T} \qquad (9)$$

Denoting the non-tradable component of GDP by $n=QR_Q$ and the tradable component as $s = (1-\varphi)TR_T$, the total derivatives for each tax component are as follows:

$$dY_t = -t\alpha_\pi d\pi \tag{10}$$

for income taxes,

$$dY_d = -d\beta_\pi \left(\frac{n}{n+s}\right) d\pi + \tag{11}$$

$$d(1-\beta(\pi))R_Q\left[1 + \sigma_{QQ} - \sigma_{TQ}\right]\left(\frac{s}{(n+s)^2}\right)dQ +$$

$$d(1-\beta(\pi))(1-\varphi)R_T\left[\sigma_{QT} - (1+\sigma_{TT})\right]\left(\frac{n}{(n+s)^2}\right)dT$$

for indirect taxes, and

$$dy_\varphi = -\varphi\gamma_\pi\left(\frac{s+A}{n+s}\right)d\pi + \tag{12}$$

$$\frac{\varphi(1-\gamma(\pi))R_Q[(1-\varphi)(n-A)\sigma_{TQ} - (s+A)(1+\sigma_{QQ})]}{(n+s)^2}dQ +$$

$$\frac{\varphi(1-\gamma(\pi))R_T\left[(1-\varphi)(n-A)(1+\sigma_{TT}) - (s+A)(\sigma_{QT})\right]}{(n+s)^2}dT +$$

$$\frac{\varphi(1-\gamma(\pi))}{(n+s)}dA$$

for tariffs. As mentioned before the effect of trade on tax revenue is not clear. Based on the theoretical concept, i) When the own-price elasticity of supply for tradable is sufficiently large relative to cross-price elasticity, such that $(1+\sigma_{TT})>\sigma_{QT}$, an improvement in the terms of trade, denoted by an increase in T; will reduce the yield from domestic indirect taxes and vice versa for a deterioration in the terms of trade; (ii) when the own-price elasticity of supply for tradable is sufficiently large relative to cross-price effects and the share of tradable in total GDP is not too large, such that $(1+\sigma_{TT})>\sigma_{QT}(s+A)/((1-\varphi)(n-A))$, an improvement in the terms of trade will improve the trade tax yield and vice versa for a deterioration in the terms of trade; (iii) movements in the terms of trade have no impact on the income tax yield.

4. Model Specification and Econometric Results

What affects tax revenue has been the subject of a long debate. Before turning to the evidence, we discuss factors that matter most for explaining tax revenue. It is possible to classify the factors into three main groups: Economic indicators (Such as GDP growth rate, trade liberalization, share of agriculture over GDP and exchange rate), Socio demographic indicators (For instance urbanization), Political indicators (Like democracy). The construction of this relationship in the framework of a dynamic panel can be specified as:

$$Tax_{i,t}= \alpha_i + \gamma_t + \beta_1 Tax_{i,t-1}, + \beta_2 GDP_{i,t} + \beta_3 Trd_{i,t} + \beta_4 Agr_{i,t} + \beta_5 Exc_{i,t} + \quad (13)$$
$$\beta_6 Urb_{i,t} + \beta_7 Demo_{i,t} + \varepsilon_{i,t}$$

Variables are expressed across a series of countries (i=1, … ,N) and time periods (t=1, …,T). The first two terms on the right side of the equation are intercept parameters, which change among the various countries i and years t. They allow for specific effects across countries (α_i) and across time (γ_t). εit shows random disturbance. As a dependent variable, we use tax revenue as a share of GDP. Explanatory variables include the following:

GDP- GDP growth rate

Trd- trade liberalization

Agr- share of agriculture over GDP

Exc- official exchange rate

Urb- urbanization

Demo- democracy

GDP growth rate: Based on the Wagner law, since the demand for public services is sensitive to income (it is elastic), economic development is accompany with an increased request for public goods and services which need to be financed by increasing tax revenue. Also, development is related to larger capability to levy and collect taxes (Chelliah, 1971). Hinrichs (1966) and Tanzi (1992) point out to a positive link between development and tax revenue of a country.

Trade liberalization: Openness degree, which is measured as the share of international trade in GDP, may also have a significant impact on tax revenues. It could be considered as an indicator of liberalization level of the economy. Certain features of international trade make it more amenable to taxation than domestic activities. In developing countries, the international trade sector is typically the most monetized sector of the economy. Entrance and exit to the country takes place in specified locations. Thus import and export shares could be an important determinant of tax revenues (Karagöz, 2013).

Share of agriculture over GDP: This variable is used as a proxy to control for the difficulty in collecting taxes. A strong negative relation between agriculture's share in GDP and tax revenue could be expected. In the developing countries, it is difficult to tax the agricultural sector, since an outsized part of it consists of subsistence and little farmers, notoriously tough to impose tax on the massive numbers that sell their merchandise in informal markets (Stotsky and WoldeMarian, 1997). On the other hand, since many public sector activities are urban based, a declining share of agriculture in GDP tends to be linked to an increase in demand for public expenditures and thus put pressure to raise tax revenue (Dioda, 2012). Also, if agricultural exports have a dominant role in the exporting sector of a country, it may lead to a positive relationship.

Official exchange rate: Tanzi (1989) presented several wide-ranging hypotheses of the relationship between various macroeconomic variables, including exchange rate and tax revenue. He observed that there is often an inverse relationship between a country's tax revenue and the real level of its official rate of exchange. He argues that overvaluation has a direct effect by suppressing import and export bases measured in domestic currency terms. This reduces collections of international trade taxes and sales and excise taxes, which are usually levied on domestic and imported consumption. Overvaluation also has indirect effects by reducing the incentive to produce goods for export, encouraging capital flight and currency substitution, weakening the balance of payments, encouraging black markets, and encouraging trade restrictions (Agbeyegbe, *et al.,* 2004)[4].

---

[4] For more detailed see Reisen (1990) and Seade (1990)

Urbanization: Urbanization is crucial for its political, social and cultural features. It is expected that urbanization and tax revenue must exhibit a positive link. Since, it increases citizens' demand and needs for public products and services (Tanzi, 1987). The density of population ought to be absolutely connected with tax revenue, because it leads to a reduction in the cost of tax collection and controlling for tax evasion (Ansari, 1982) and government's ability to collect taxes is enhanced by structural changes, which are concomitant with urbanization.

Democracy: There is no consensus in the empirical literature supporting the significance of political variables such as the level of democracy and the duration of a political regime as determinants of tax revenue. On the one hand, in line with authors like Boix (2003) and Acemoglu and Robinson (2006), democracy is a significant factor for distributing income from the rich to the poor that creates an enlarged welfare state, and a stronger and more efficient tax system, based more on direct taxes than on indirect taxes. Also, under a non-democratic regime the size of the public sector would be relatively small, because a large part of citizens are excluded from the decision making process. Thus, a transition towards a democratic government would coincide with an increase in taxes and public spending in accordance with the theory of the median voter, moving in the direction of a better redistribution of wealth (Dioda, 2012). On the opposite hand, some authors like Barro (1979) and Wittman (1989), consider that the most drivers of public policy are not political factors. Also, Mulligan *et al.,* (2004) did not find evidence that democracy can explain the changes in tax revenue. Based on literature, three common measures are exist about measuring democracy: The first measure of democracy is derived from the data on political rights published by Freedom House. The second measure is derived from the democracy index published in Polity IV. The third measure is the measure of democracy published in the International Country Risk Guide. Our focus attention leads us to the fact that most of the scant literature on democracy debate use Polity Project data. Therefore, in order to increase the credibility of our results, we use polity which is derived from the democracy index published by Polity IV. The Polity IV Project has rated the levels of democracy for each country and year using coded information on the general qualities of political institutions and processes, including executive recruitment, constraints on executive action, and political competition. These ratings have been combined into a single, scaled measure of regime governance:

the Polity score. The Polity scale ranges from -10, fully institutionalized autocracy, to +10, fully institutionalized democracy.

The data is mainly taken from World Bank indicators. Due to reasons related to data availability, we restricted the analysis to the period 1990-2012 and 83 developing middle-income countries (See appendix for included countries). Table 1 contains descriptive statistics for all variables. Table 2 provides the correlation between variables.

Table 1: Descriptive Statistics of Variables

Variables	Mean	Maximum	Minimum	St. deviation
tax revenue	16.87	61.06	0.022	7.02
GDP growth rate	3.89	88.95	-44.90	5.98
trade liberalization	84.14	223.5	11.08	36.67
share of agriculture over GDP	15.65	65.86	2.03	10.11
official exchange rate	624.7	25000	0.00002	2425
urbanization	50.74	91.29	12.98	17.13
democracy	2.21	10.00	-8.00	16.03

Source: Own calculation

Table 2: Correlation Matrix of Variables

	Tax	Taxt-1	GDP	Trd	Agr	Exc	Urb	Demo
Tax	1.00	0.156	-0.064	0.440	-0.287	-0.153	-0.092	-0.070
Taxt-1		1.00	0.101	0.028	-0.009	0.006	-0.017	0.018
GDP			1.00	0.019	0.0001	0.005	-0.060	0.009
Trd				1.00	-0.192	-0.065	-0.012	-0.047
Agr					1.00	-0.004	-0.585	0.001
Exc						1.00	0.089	0.010
Urb							1.00	0.099
Demo								1.00

Source: Own calculation

In the first step of our analysis, it is crucial to ascertain the integrational properties of the data series. In a panel data model, when the presence of a unit root in a model is admitted, one may obtain apparently significant relationships from unrelated variables. This phenomenon is called the spurious regression problem. In order to test the data stationary and the order of integration of variables, we apply two conventional unit root tests, Im *et al.,* (2003) and levin *el al.,* (2002) (hear after IPS and LLC). These tests are widely known and understood, so we refrain from repeating the methodology here. The results in table 3 indicate that there is no presence of unit root. The IPS and LLC tests reject the null hypothesis of a unit root, showing that all variables used in the study are stationary at level.

Table 3: Unit Root Test

Variables	IPS	LLC
tax revenue	-4.27 (0.000)	-10.21 (0.000)
GDP growth rate	-19.29 (0.000)	-19.61 (0.000)
trade liberalization	-5.01 (0.000)	-6.02 (0.000)
share of agriculture over GDP	-5.52 (0.000)	-11.81 (0.000)
official exchange rate	-7.39 (0.000)	-6.66 (0.000)
urbanization	-9.50 (0.000)	-13.65 (0.000)
democracy	-10.96 (0.000)	-6.00 (0.000)

Note: P values in parentheses.
Source: Own calculation

Various econometric approaches have been used to estimate the before mentioned function relying largely on cross-sectional (and more recently, panel) data by OLS or GLS. However, the possibility of existing endogeneity of variables in a model using macro variables should be bear in mind. In this case, two stage least squares (2SLS) or generalized method of moments (GMM) are suggested as remedy.

GMM does not require complete knowledge of the distribution of the data and it ensures consistency and efficiency while dealing with heteroskedasticity and serial correlation. It undertakes the issue of persistence of tax revenue performance over time by including lagged dependent variable in the regression, since, a simple panel analysis, either with fixed or random effects, is generally not sufficient to fully investigate the lag structures inherent in a macroeconomic variable. It also handled the potential bias that could be created by inclusion of dependent variable in the regression. The particular approach we adopt is based on the GMM estimators for panel data model and is due to Arellano and Bond (1991).

The Sargan test is designed to test the validity of the instruments, employed to estimate the model, by analyzing the sample analog of the moment conditions. It attempts to answer the question, given that a subset of instrumental variables is valid and exactly identifies the coefficients, are the extra instrumental variables valid? Failure to reject the null should be interpreted as favoring the specified model. Also, we apply Arellano–Bond test for serial correlation in the first-differenced errors. Table 4 presents the outcome of examining the determinants of total tax revenue. Based on the Sargan test, the null hypothesis of the validity of the instrumental variable cannot be rejected, i.e. the instrument passes the test and errors are independently distributed. The results for 1st and 2nd –order serial correlation report the fact that the assumption of serially uncorrelated errors is appropriate.

Many of the estimated coefficients for the explanatory variables are in line with the predictions and largely coincide with previous findings in the literature and the overall fit of the panel model is also reasonable. First of all, it is interesting to note that the coefficient on the lagged dependent variable is positive and significant in the regression, suggesting that there is a sharp adjustment over time in the tax revenue.

GDP growth as a good indicator of the overall level of economic development and sophistication of the economic structure shows positive and significant sign in revenue equation. As countries develop, they will improve their public administrations, judicial systems and promote structural and institutional reforms, so that, the costs of the tax system will be gradually reduced. Also, there is a shift in taxable income and taxpayers move into higher tax brackets, and this possibly results in

higher amount of personal income tax collection. This result is in line with Hinrichs (1966), Chelliah (1971), Tanzi (1992, 1987), and Ghura (1998) who found a positive correlation between the level of development and tax revenue.

Table 4: GMM Estimation 1990-2012

Variables	Coefficient	Z	P>|Z|
Lagged tax revenue	0.477	69.5	0.000
GDP growth rate	0.038	9.06	0.000
Trade liberalization	0.0321	22.3	0.000
Share of agriculture over GDP	-0.1459	-12.8	0.000
Official exchange rate	-0.0002	-5.26	0.000
Urbanization	-0.1215	-7.02	0.000
Democracy	0.0180	5.47	0.000
Wald Chi^2	405.08		
Sargan	62.37 (1.000)		
A(1)	-2.79 (0.0051)		
A(2)	1.101 (0.2709)		

Source: Own calculation

*Sargan is asymptotically distributed as a Chi2 under the null of instrument validity, with p-value in parentheses.

**A1 and A2 are tests for first-order and second-order serial correlation in the first differenced residuals, asymptotically distributed as a Chi2 under the null of no serial correlation, with p-value in parentheses.

Openness as a proxy for trade liberalization has a positive significant effect on the total tax revenue. As an increase in the ratio of imports plus exports to GDP of one percent, increases revenue performance by up to 0.032 percent. This is because, as countries liberalize their trade, trading with the rest of the world become relatively easier, raising the variety of goods and services that help boost corporate profit and the flow of goods and services within countries. In this way, trade-related taxes are easier to impose because the goods enter or leave the country at specified locations and tax revenue is mainly obtained from taxes on the exports and imports of country. The positive effect of trade liberalization on trade revenue is similar to the findings by Ebrill *et al.,* (1999), and Khattry and Rao (2002).

The share of agriculture over GDP is statically significant and inversely related to tax revenue. One percent growth in the share of agriculture reduces tax revenue by 0.14%. The impact is relatively strong and it is in line with previous findings by Stotsky and WoldeMariam (1997). Agricultural activities are difficult to tax, because large part of the agricultural sectors are small-scale with limited number of taxpayers paying tax on income or profits and agricultural products are exempted from indirect taxes. Also, substantial part of the output is consumed and not marketed.

The significant negative relationship between exchange rate and tax revenue indicates the fact that depreciation of the domestic currency leads to a decline in the volume of imports and hence leads to a loss of trade tax revenue. Also, it may cause to a reduction in the personal real income and consequently hamper the potential amount of income tax.

Earlier studies have found that total tax revenue increases when a society becomes more urbanized, but somewhat surprisingly, it appears significant with negative sign.

Democracy emerges significant and positively correlated with tax revenue. A more democratic and peaceful political regime enjoys more legitimacy and loyalty among taxpayers which leads to a higher degree of voluntary compliance. In low level of democracy, large part of the citizens may be excluded from the key decision making process, and perhaps there are few or practically no political parties that represent the interests of the electorate, being largely influenced by the vested interests of lobbies and elites (Grossman and Helpman, 1994). According to this view, elites exert power and pressure on political parties in order to defend their interests, and in particular to prevent taxes from rising and keep their special privileges and exemptions.

5. Conclusion and Policy Recommendation

The macroeconomic consequences of trade liberalization have generated a great deal of debate among scholars in recent years. There are bodies of theoretical and practical research on the role of trade liberalization as a source of government revenue. The aims of this paper are twofold, at first we try to shed some lights on the basic question "Do middle income countries can benefit trade liberalization in order to promote tax

revenue?" Secondly, introducing those factors that matter most for explaining tax revenue. In so doing, to fulfill these aims we use a dataset, which includes 83 developing countries over time period covering the years from 1990 to 2012. The main conclusion of GMM estimation is that there exists a tradeoff between a greater degree of openness to international trade and the revenue collected by government. A set of factors that can potentially influence tax revenue has been divided into various groups like economic, socio demographic and political indicators. The empirical results of the panel model here built and econometrically tested indicate that GDP growth and democratic system of the economy are positively related to tax revenue in a statically significant way. The share of agriculture over GDP, official exchange rate and urbanization are also statically significant, but negatively associated with tax revenue.

The result has important implications for countries that have been reluctant to undertake trade liberalization for fear of the revenue consequences. Bear in mind, there is not much economic policy can do to change an economy's relative structure (at least in the short run), for most countries no such limitations exist regarding openness. There is the need for government to emphasize the focus on liberalization in order to ensure the successful performance of trade liberalization policy and achieve the enormous revenue from trade tax. In addition, middle-income countries profit in terms of upper tax-revenue if formal activities, like the manufacturing sector, is growing faster than the agricultural sector. Developing countries must actively strive to increase the opportunities for more growth and development and improve the degree of democracy.

Reference

Acemoglu, D., and Robinson. J.A. (2006), Economic Origins of Dictatorship and Democracy, Cambridge University Press.

Adam, C.S., Bevan, D.L., and Chambas, G. (2001), "Exchange Rate Regimes and Revenue Performance in Sub-Saharan Africa," *Journal of Development Economics*, 64(1), 173-213.

Agbeyegbe, T., Stotsky, J.G., and WoldeMariam, A. (2004), "Trade Liberalization, Exchange Rate Changes, and Tax Revenue in Sub-Saharan Africa," *IMF Working Paper*, No. 178.

Ansari, M.M. (1982), "Determinants of Tax Ratio: A Cross-Country Analysis," *Economic and Political Weekly*, 17(25), 1035-1042.

Arellano, M., and Bond, B. (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations," *Review of Economic Studies*, 58(2), 277–297.

Barro, R.J. (1979), "On the Determination of Public Debt," *Journal of Political Economy*, 87, 940-71.

Baunsgaard, T., and Keen, M. (2005), "Tax Revenue and (or?) Trade Liberalization," *IMF Working Paper*, No. 112.

Boix, C. (2003), Democracy and Redistribution. Cambridge University Press.

Chelliah, R.J. (1971), "Trends in Taxation in Developing Countries," *IMF Staff Papers*, 18(2), 254-331.

Dioda, L. (2012), "Structural Determinants of Tax Revenue in Latin America and the Caribbean, 1990-2009," *Comisión Económica para América Latina y el Caribe (CEPAL)*, No. 041.

Dixit, A., and Norman, V. (1980), The Theory of International Trade. Cambridge University Press.

Ebrill, L., Stotsky, J., and Gropp, R. (1999), "Revenue Implications of Trade Liberalization," *IMF Occasional Paper*, No. 180.

Epaphra, M. (2014), "The Revenue Implications of Trade Liberalization in Tanzania," *Journal of World Economic Research*, 3(3), 25-36.

Ghura, D. (1998), "Tax Revenue in Sub-Saharan Africa: Effects of Economic Policies and Corruption," *IMF Working Paper*, No. 135.

Greenaway, D., and Milner, C. (1993), The Fiscal Implications of Trade Policy Reform: Theory and Evidence, UNDP-World Bank Trade Expansion Program Occasional Paper, 9, Washington, DC.

Grossman, G.M., and Helpman, E. (1994), "Protection for Sale," *American Economic Review*, 84(4), 833-850.

Gupta, A.S. (2007), "Determinants of Tax Revenue Efforts in Developing Countries," *IMF Working Paper*, No. 184.

Harrison, A. (1996), "Openness and Growth: A Time-Series, Cross-Country Analysis for Developing Countries," *Journal of Development Economics*, 48(2), 419-447.

Harrison, A., and Hanson, G.H. (1999), "Who Gains from Trade Reform? Some Remaining Puzzles," *Journal of Development Economics*, 59(1), 315-324.

Hinrichs, H.H. (1966), A General Theory of Tax Structure: Change During Development. Cambridge, MA: Harvard Law School International Program.

Im, K.S., Pesaran, M.H., and Shin, Y. (2003), "Testing for Unit Roots in Heterogeneous Panels," Journal of Econometrics, 115(1), 53-74

Karagöz, K. (2013), "Determinants of Tax Revenue: Does Sectorial Composition Matter?" *Journal of Finance, Accounting and Management*, 4(2), 50-63.

Khattry, B., and Rao, J.M. (2002), "Fiscal Faux Pas?: An Analysis of The Revenue Implications of Trade Liberalization," *World Development*, 30(8), 1431–1444.

Levin, A., Lin, C.F., and Chu, C. (2002), "Unit Root Rests in Panel Data: Asymptotic and Finite-Sample Properties," *Journal of Econometrics*, 108, 1-24.

Longoni, E. (2009), "Trade Liberalization and Trade Tax Revenues in African Countries," *Working Paper Series*, No. 158.

Muibi, S.O., and Sinbo, O.O. (2013), "Macroeconomic Determinants of Tax Revenue in Nigeria (1970-2011)," *World Applied Sciences Journal*, 28(1), 27-35.

Mulligan, C.B., Gil, R., and Sala-i-Martin, X. (2004), "Do Democracies Have Different Public Policies Than Non-Democracies?" *Journal of Economic Perspectives*, 18(1), 51-74.

Nwosa, P.I., Saibu, M.O., and Fakunle, O.O. (2012), "The Effect of Trade Liberalization on Trade Tax Revenue in Nigeria," *African Economic and Business Review*, 10(2), 28-43.

Pupongsak, S. (2009), The Effect of Trade Liberalization on Taxation and Government Revenue. A thesis submitted to the University of Birmingham for the degree of Doctor of Philosophy.

Reisen, H. (1990), Interaction between the Exchange Rate and the Public Budget in Major Debtor Developing Countries. In Fiscal Policy in Open Developing Economies, ed. by Vito Tanzi (Washington: International Monetary Fund), 82–93.

Rodríguez, F., and Rodrik, D. (2000), "Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence," *NBER Macroeconomics Annual*, 15, 261-338.

Seade, J. (1990), Tax Revenue Implications of Exchange Rate Adjustment. In Fiscal Policy in Open Developing Economies, ed. by Vito Tanzi (Washington: International Monetary Fund), 54–65.

Stotsky, J.G., and WoldeMariam, A. (1997), "Tax Effort in Sub-Saharan Africa," *IMF Working Paper*, No. 107.

Tanzi, V. (1987), Quantitative Characteristics of Tax Systems of Developing Countries. In D.M.G. Newbery and N. H. Stern Editions, The Theory of Taxation for Developing Countries, New York, Oxford University Press.

Tanzi, V. (1989), "The Impact of Macroeconomic Policies on the Level of Taxation and the Fiscal Balance in Developing Countries," *IMF Staff Paper,* 36(3), 633-656.

Tanzi, V. (1992), Structural Factors and Tax Revenue in Developing Countries: A Decade of Evidence, in Open Economies: Structural Adjustment and Agriculture, ed. by Ian Goldin and L. Alan Winters (Cambridge: Cambridge University Press), pp. 267–281.

Wittman, D. (1989), "Why Democracies Produce Efficient Results," *Journal of Political Economy*, 97, 1395-1424.

Appendix

Countries included in analysis		
Albania	Ghana	Panama
Algeria	Grenada	Papua New Guinea
Angola	Guatemala	Paraguay
Argentina	Honduras	Peru
Armenia	Hungary	Philippines
Azerbaijan	India	Romania
Belarus	Indonesia	Samoa
Belize	Iran, Islamic Rep.	Sao Tome and Principe
Bhutan	Jamaica	Senegal
Bolivia	Jordan	Serbia
Bosnia and Herzegovina	Kazakhstan	Seychelles
Botswana	Kiribati	South Africa
Brazil	Kyrgyz Republic	Sri Lanka
Bulgaria	Lao PDR	St. Lucia
Cabo Verde	Lebanon	St. Vincent and the Grenadines
Cameroon	Lesotho	Sudan
China	Macedonia, FYR	Suriname
Colombia	Malaysia	Syrian Arab Republic
Congo, Rep.	Maldives	Thailand
Costa Rica	Mauritius	Tunisia
Cote d'Ivoire	Mexico	Turkey
Dominica	Moldova	Ukraine
Dominican Republic	Mongolia	Vanuatu
Ecuador	Morocco	Venezuela, RB
Egypt, Arab Rep.	Namibia	West Bank and Gaza
El Salvador	Nicaragua	Yemen, Rep.
Fiji	Nigeria	Zambia
Georgia	Pakistan	