WP/21/35

IMF Working Paper

A Time to Build: Does Technical Assistance Matter for Revenue Mobilization?

by Ralph Chami, Elorm Darkey and Oral H. Williams

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INTERNATIONAL MONETARY FUND

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IMF Working Paper

Institute for Capacity Development

A Time to Build: Does Technical Assistance Matter for Revenue Mobilization?

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February 2021

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Abstract

We use a unique data set for 115 countries, from 2000–18, and 5-year non-overlapping averages to explore the impact of technical assitance on revenue mobilization. To the authors' knowledge this is the first such effort to determine a direct relationship between technical assistance and the improvement in tax revenues. The paper finds that technical assistance significantly and positively increases tax revenues. Both income per capita and openness were found to positively improve the tax ratio in line with findings in the literature. Dynamic estimations also uncovered a long-run relationship among technical assistance, income per capita, openness, and tax revenues. This result further underscores that it takes time to build capacity and institutional resilience.

JEL Classification Numbers: H00, O11, O43 and Q01

Keywords: Revenue mobilization; fiscal policy; institutions; financing for development, sustainable development goals.

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[1] We thank the participants in the IMF's Institute for Capacity Development's Lunchtime Seminar, reviewing Departments, Olumuyiwa Adedeji, Karim Bahroumi, Reda Cherif, Seymour Douglas, Raphael Espinoza, Alexander Klemm, Keyra Primus, Kamiar Mohaddes, Mehdi Raissi, and Tim Willems for useful comments and suggestions.

I. INTRODUCTION

"*Little else is required to carry a state to the highest degree of opulence...but peace, easy taxes, and a tolerable administration of justice*." Adam Smith

Domestic revenue mobilization (DRM) has been integral to the Financing for Development agenda articulated by the United Nations. The centrality of public finance to development in the post-war period has won widespread acceptance (Kaldor, 1963, Gaspar et. al, 2016). In addition, the dovetailing of domestic revenues with external financing is viewed as critical to the achievement of the 2030 sustainable development goals (SDGs). However, the COVID-19 pandemic has likely pushed back the achievement of several of these goals owing to the depth and duration of its adverse social and economic impacts. It is estimated that the pandemic has pushed up to 100 million people into extreme poverty.

In an increasingly interconnected world, the foundations for a stronger global economy also hinge on building resilience and fostering equity. Improvements in DRM allow countries to respond to shocks through the creation of fiscal space, in addition to allowing low-income countries (LICs) to maintain spending if aid is phased out. Beyond this goal, fairer and more efficient tax systems could engender improvements in governance by strengthening social contracts where the citizenry contributes their fair share of taxes. As debt levels have risen in the face of the pandemic, in some cases to unsustainable levels, countries' ability to service their debt has become critical. While initiatives like the G20's Debt Service Suspension Relief Initiative are a welcome palliative for LICs, greater efforts will be needed for LICs and some emerging market countries to place their debt on a sustainable path. At the same time, this depends on the quality of their institutions and human capacity.

Strong institutions are deemed to be critical to a country's long-term development. This has been underscored in the work of Adam Smith, Landes (1998), North (1990), and Acemoglu (2002). Indicators of institutional quality have been observed to be closely correlated with income dispersion among countries (WEO, 2003). However, consistency in the implementation of reforms, policy reversals, and absorptive capacity can lead to unevenness in impact and effectiveness.

Against this background, this paper explores the role of capacity development (CD), in particular, technical assistance in boosting tax revenues across a large cross-section of countries[2]. The impact of CD has been a longstanding question, including how well these interventions are aligned with countries' developmental objectives. It is noteworthy that the purpose of CD interventions could also encompass equity or efficiency considerations. As the IMF has ramped up its provision of CD to its membership—accounting for about one-

[2] Capacity development comprises both technical assistance (TA) and training.

third of its budget—this question has become even more pressing[3]. A key challenge has been measurement, identification between the intervention and the outcome, and the age-old issue of endogeneity. We attempt to address these issues in this paper.

The paper contributes to the literature in several ways. To our knowledge, this paper is the first to evaluate the direct impact of technical assistance on tax revenues given their importance to the achievement of the SDGs. Using a unique data set for 115 countries over 2000–18 and 5-year non overlapping averages, we find that technical assistance had a significant and positive direct impact on tax revenues, after accounting for controls suggested by the literature. Technical assistance comprises the delivery of expertise in tax administration and tax policy measured in full-time equivalent (FTE), where one FTE comprises 240 working days. Dynamic specifications using annual data, further uncover a long-run relationship among technical assistance, income per capita, openness, and the tax ratio, underscoring it takes time to build capacity and institutional resilience. We verify that this relationship is not driven by a third variable by first estimating a bivariate equation between technical assistance and tax revenues.

Methodologically, we employ three econometric techniques. These comprise (i) panel fixed effects (FE); (ii) FE instrumental variables (IV) and (iii) cross-section autoregressive distributed lag (CS-ARDL), pool mean group (PMG) estimator. The latter technique takes account of cross-country heterogeneity and cross-sectional dependence which is important in the study given country specific effects, revenue volatility, and possible feedback effects.

The remainder of the paper is organized as follows: In Section II we undertake a brief review of the literature; Section III discusses the econometric methodologies employed data sources; and Section IV presents the main results; and Section V offers some concluding remarks.

II. LITERATURE REVIEW

Most research on the determinants of tax revenues in developing countries use panel data. In general, the research employs a theoretical framework of tax behavior t developed by Heller (1975). This framework assumes that governments maximize welfare, whose arguments are private disposable income and public goods and services that is subject to a financing constraint comprising taxes, foreign grants and loans and domestic borrowing. Earlier papers used OLS (Leuthold, (1991), fixed effects (FE) Stotsky and Woldemariam, (1997), but more recent papers used instrumental variables generalized least squares (Ghura, (1998) to general method of moments (GMM) Agbeyegbe et al. (2006), Gupta (2007), and Addison and Levin, (2011).

[3] The IMF is one of several CD providers comprising the UN, OECD, European Commission and bilateral development partners.

Early approaches that adopted this theoretical framework, leveraged a standard set of controls that included measures of income. Several researchers employed GDP per capita as a measure of income, Leuthold (1991), Stotsky and Woldermariam (1997), Ghura (1998), and Gupta (2007). Some of these early approaches postulated an ambiguous relationship between the tax ratio and the inverse of per capita income on the premise of the differential impact of the increase in income of different categories of income. Most studies, Leuthold (1991) Ghura (1998), Stotsky and Woldermariam (1997), Gupta (2007) and Addison and Levin (2011) found a positive relationship.

The contribution of the agricultural and extractive sectors which represent elements of the tax base has been explored in some studies. The agricultural sector, given a high degree of subsistence in LICs and sizeable administrative costs, were found to have a negative impact on the tax ratio (Leuthold (1991), Stotsky and Woldemariam (1997), and Ghura (1998)). In contrast, the mining sector which is better organized and relatively easier to tax was found to have a positive relationship with the tax ratio (Leuthold, (1991) and Ghura (1998). However, Stotsky and Woldemariam (1997) find mining to be negatively related to the tax ratio.

In the context of globalized and interconnected trading system, **most studies employed a measure of openness (Leuthold, 1991, Stotsky and Woldemariam (1997), and Ghura (1998), Agbeyegbe et al. (2006), Gupta (2007).** In general, most studies used the ratio of exports and imports to GDP as a measure of openness which was found to be positively related to the tax ratio. Agbeyebe et al. (2004) in particular explored with a greater degree of granularity the relationship between trade liberalization, exchange rates, and tax revenue variables and found evidence that the relationship between trade liberalization and tax revenue is sensitive to the measure used to proxy trade liberalization.

These earlier models were augmented to explore the role of macroeconomic variables. Tanzi (1989) argued for the inclusion of inflation for the following reasons: (i) the Tanzi-Oliveira effect which accounts for lags between the imposition and actual collection of taxes resulting in a lower tax take in real terms; (ii) failure to adjust excise taxes for inflation leading to lower tax collections; and (iii) reductions in the tax base as tax payers adjust their portfolios to avoid taxation. Ghura (1998) found inflation to negatively impact revenues. Total public debt or external debt have been included in some models on the premise that debt repayments could boost aggregate demand through increased fiscal space. This would raise the tax ratio or at certain levels the stock of debt could create macroeconomic imbalances and reduce taxes. Ghura (1998) and Teera and Hudson (2004) found external debt (contemporaneous) to reduce the tax ratio.

The role of institutions featured in later models as this aspect of sustainable development gained greater traction in the literature. Ghura (1998), introduced a measure of corruption in his empirical strategy which was found to significantly reduce the tax ratio that drew on the work of Tanzi (1998). Mauro, (1996) provided empirical evidence that

sizable economic dividends accrue through efforts to reduce corruption. Gupta, (2007) introduced variables designed to capture institutional factors such as political stability, economic stability, corruption, law and order and government stability. A lowering of corruption was found to increase tax revenues.

Another related branch of the literature explored the complementarities between foreign aid on the tax ratio but with ambiguous results. Gupta, (2007), found aid to have a positive impact on the tax ratio. In contrast, Addison and Levin, (2011) found that aid lowered the tax ratio. Gupta et al. (2003), found that grants had a dampening effect on tax revenues, but this effect was modest and that the negative effects of corruption were greater.

III. Econometric Model and Data

We begin with the following basic panel model that nests most of the models highlighted in the literature review.

$$y_{it} = \alpha_{it} + \beta_{it} TA_{it-1} + \theta X_{it} + \varepsilon_{it} \quad (1)$$

y_{it} is the tax-to-GDP ratio, TA_{it} is technical assistance in revenue administration and tax policy and X_{it} comprises a vector of controls derived from the literature. As technical assistance takes time to build capacity and institutional resilience, this variable enters the equation with a lag. Technical assistance interventions in revenue administration and tax policy have a primary objective of increasing tax revenues including by widening the tax base but could also encompass equity and efficiency considerations. This one to one relationship allows us to address the issue of correspondence and identification with an adequate number of observations. In contrast, in the public financial management space under the Public Expenditure and Financial Accountability (PEFA) framework, there are seven pillars and 31 indicators, thus warranting more data to map the indicators to the pillars.

Drawing on the growth literature, we use five-year non-overlapping averages as this is likely to filter out business cycle effects. As a first pass, we estimate equation (1) using fixed effects (FE). We further estimate equation (1) by FE using instrumental variables. Finding valid instruments in a cross-country setting is challenging. Drawing on the growth literature to highlight this problem, Bazzi and Clemens (2013), observed that many papers use population and area as different variables. As noted by Cherif and Hasonov (2020), these instruments suffer from validity and possibly weak instrument problems. The allocation of TA to a given country is likely influenced by the country's participation in an IMF lending program, in addition to its membership of one of its Regional Capacity Development Centers. We use these factors as instruments, while recognizing that "sharper instruments" may well exist. This mirrors the approach adopted by Barro (2005), who used a country quota size and voting patterns in the United Nations and the extent of bilateral trade linkages in the allocation of IMF funding programs.

We further explore other dynamic specifications in particular the dynamic cross section Auto Regressive Distributed Lag (CS-ARDL) estimator using annual data. Each dynamic model has its tradeoffs. The advantage of GMM is that it corrects for biases associated with the joint endogeneity of explanatory variables and the problems induced by unobserved country-specific effects, while CS-ARDL takes account of cross-country heterogeneity and cross-sectional dependence (Cavalcanti et al. (2015). GMM also restricts all the slope coefficients to be identical across countries; assumes that the time effects are homogenous; and that the errors are cross-sectionally independent. If any of these conditions are not satisfied, the GMM method can produce inconsistent estimates of the average values of parameters (see Pesaran and Smith, 1995, for more details).

The CS-ARDL panel estimator of Pesaran et al. (1999), is an intermediate case between the averaging and pooling methods of estimation. It restricts the long-run coefficients to be homogenous over the cross-sections, but allows for heterogeneity in intercepts, short-run coefficients (including the speed of adjustment) and error variances. The CS-ARDL estimator also generates consistent estimates of the mean of short-run coefficients across countries by taking the simple average of individual country coefficients. Another advantage with this technique is that cross-section averages capture a range of unobserved common factors, act as instruments in the regressions and obviate the need to include too many controls in estimations. This method avoids the need for pre-testing the order of integration given that they are valid whether the variables of interest are I (0) or I (1). It is also robust to omitted variables bias and simultaneous determination of growth regressors. The main requirements for the validity of this methodology are that, first, there exists a long-run relationship among the variables of interest and, second, the dynamic specification of the model is sufficiently augmented so that the regressors become weakly exogenous and the resulting residual is serially uncorrelated (Cavalcanti et al. 2015).

The following equation was used to estimate a panel CS-ARDL (p, q):

$$y_{it} = c_{it}^{*} + \sum_{l=1}^{pi} \theta_{il} y_{i,t-1} + \sum_{l=0}^{qi} \beta'_{il} x_{i,t-l} + \sum_{l=1}^{pi} a_{il} \bar{y}_{t-l} + \sum_{l=0}^{qi} b'_{il} \ddot{x}_{t-l} + \varepsilon_{it} \quad (2)$$

Where y_{it} is the tax ratio, for country *i* in year *t*, $\boldsymbol{c^{*}_{it}}$, fixed effects, $\mathbf{x_{it}}$ a vector of explanatory variables including income per capita, openness, technical assistance and debt. $\bar{\mathbf{y}}_{\mathbf{t}}$ and $\ddot{\mathbf{x}}_{\mathbf{t}}$ represent the simple cross-section averages of $\mathbf{y_{it}}$ and $\mathbf{x_{it}}$ in year t.

The data used in this study covers 115 countries over the period 2000–18 and are estimated in logs for the CS-ARDL and with 5-year non-overlapping averages for FE and FE-IV. Data on tax-to-GDP ratio, agriculture value added as a share of GDP, trade openness measured as the sum of exports and imports to GDP, debt-to-GDP and inflation were obtained from the World Banks' World Development Indicators, IMF's World Economic Outlook and International Financial Statistics databases. Country participation in an IMF program was obtained from the IMF's Monitoring of Fund Arrangements (MONA) database while the technical assistance (TA) variable from the IMF's TA database. Corruption and government

effectiveness were derived from the World Banks' Governance Indicators. The conflict variable was obtained from Uppsala Conflict Data Program/International Peace Research Institute Oslo (UCDP/PRIO) Armed Conflict Dataset.

IV. RESULTS AND DISCUSSION

The results from the estimation of Equation (1) are presented in Table 1. They illustrate that technical assistance aimed at increasing tax revenues is positive and significant at the five percent level.

Regarding variables suggested by the literature, tax revenues grow in line with an increase with income, which has the largest impact. This is followed by the degree of openness which also led to a positive increase in tax revenues. These findings regarding the order of magnitude of the coefficients on income per capita and openness were in line with previous results from the literature. Measures of institutional quality such as the control of corruption improved the tax ratio. Alternative measures of government effectiveness were not significant, neither were measures of conflict. Notwithstanding, Akitoby et al. (2020) and Akanbi (2019) have highlighted that improving institutions is important for revenue mobilization. The coefficient of the agricultural sector was not significant, neither were those for other measures of the tax base comprising, secondary and tertiary sectors. While the coefficient of participation in an IMF program was positive, it was however insignificant. By way of comparison, Crivelli and Gupta (2016) found that revenue conditionality in IMF-supported programs, reflecting reliance on technical assistance, had a positive and significant impact on tax revenues.

In recognizing that the sample included resource rich countries, we exclude these countries to ascertain whether the results highlighted in Table 1 are still valid. The coefficient of the technical assistance variable was positive and significant (Table 2). Equally important was the income per capita and openness variables in contributing to the increase in tax revenues. The control of corruption also contributed to an increase in the tax ratio underscoring earlier findings by Akitoby et al. (2020).

LICs and more importantly fragile states are those with the greatest need for capacity development in order to build resilience and the case of the latter exit from a state of fragility. A study by the IMF's Independent Evaluation Office (IEO) highlighted that despite the increase in capacity development to fragile states, more is needed given large unmet needs. The coefficient of the technical assistance variable was positive and significant in improving the tax ratio, albeit subject to a small sample size (Table2). The coefficient on income had the largest impact on the tax ratio. Control of corruption was not significant in this sub-sample.

Table 1. Impact of Technical Assistance on Tax Revenues
(Fixed Effects: 5-year non-overlapping averages)

Variables	(1)	(2)	(3)	(4)
TA (t-1)	0.0361**	0.0358**	0.0388**	0.0387**
	(0.0164)	(0.016)	(0.0164)	(0.0158)
IMF Program	0.0188	0.0188	0.0182	0.0182
	(0.0293	(0.0276)	(0.0296)	(0.0279)
Trade Openness	0.192**	0.182**	0.205**	0.195**
	(0.0842)	(0.0836)	(0.0826)	(0.0816)
Agriculture	-0.0428	-0.0164	-0.0570	-0.0306
	(0.0996)	(0.101)	(0.0963)	(0.0974)
Inflation	-0.00264	-0.00249	-0.00286	-0.00271
	(0.00320)	(0.00306)	(0.00310)	(0.00293)
GDP per capita	0.386***	0.354***	0.409***	0.377***
	(0.114)	(0.112)	(0.115)	(0.113)
Debt (t-1)	-0.00848	-0.0138	-0.00304	-0.00831
	(0.0293)	(0.0285)	(0.0304)	(0.0297)
Control of Corruption		0.147**		0.149**
		(0.0582)		(0.0578)
Conflict (intensity level)			0.0297	0.0307
			(0.0317)	(0.0307)
Constant	-0.958	-0.648	-1.187	-0.879
	(1.171)	(1.148)	(1.198)	(1.172)
Observations	190	190	190	190
R-squared	0.331	0.357	0.342	0.369
No. of countries	115	115	115	115
Time Fixed Effects	No	No	No	No

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In Table 2, we present the results for the fixed effects instrumental variable regressions. We used membership of a regional technical assistance center, participation in an IMF program and lagged dependent variables as instruments following Barro, (2005). Technical assistance, trade openness, per capita income and control of corruption all contribute to a positive improvement in tax revenues in one of the equations.

Table 3 presents the results of the CS-ARDL estimates of lag order one. They show the existence of a long-run (LR) relationship between income per capita, technical assistance and the tax ratio. To ensure that this LR relationship is not driven by a third variable, we commence with a bivariate model between technical assistance and the tax ratio.[4] The error correction coefficient (-0.7) also falls within the dynamically stable range in that it was both negative and significant. The speed of adjustment for LICs was marginally slower (-0.65), perhaps reflecting weaker institutional capacity. This result further underscores that it does indeed take time to build capacity and institutional resilience. In the long run, both income per capita, openness, and technical assistance positively impact the tax ratio. The income per capita long-run coefficient had the largest impact, in line with findings from the FE, and FE-IV estimation. In addition, the long-run coefficient of the TA variable was of a similar order of magnitude of those from alternative model specifications for the full sample. Technical assistance was found to have the largest impact on tax revenues in LICs whereby a 10 percent increase in technical assistance improves the tax ratio by 1.2 percent. Similarly, the coefficients on openness and income per capita were largest for LICs although the coefficient on income per capita was not of expected sign.

V. CONCLUSIONS

The paper explores the impact of technical assistance on tax revenues by leveraging a unique dataset subject to standard controls suggested by the literature. The results show that technical assistance contributes positively and significantly to an increase in tax revenues. Dynamic panel models further confirm the existence of a long-run relationship between technical assistance, income per capita, openness, and tax revenues. This finding verifies that the long run relationship is not driven by a third variable. The results are also robust to the exclusion of resource rich countries. Technical assistance also has the largest long-run impact on tax revenues in LICs. This reinforces the view that it takes time to build capacity and institutional resilience as underscored by Akitoby et al (2018) who highlighted that sustainability of DRM episodes hinges on tax administration reforms in the key compliance areas.

[4] The error correction term in this bivariate equation was -0.57 and the long run coefficient on the TA variable 0.05.

Table 2. Impact of Technical Assistance on Tax Revenues—LICs/Fragile States and Excluding Resource Rich Countries

	(1)	(2)	(3)	(4)	(5)
	Excl. Resource Rich		FE-IV		LICS
Variables					
TA (t-1)	0.0555***	0.0558***	0.0349**	0.0178**	0.07*
	(0.0162)	(0.0167)	(0.0152)	(0.00733)	(0.04)
IMF Program	0.0118	0.00797	0.00619	0.00590	0.075
	(0.0345)	(0.0364)	(0.0261)	(0.0129)	(0.065)
Trade Openness	0.176***	0.196***	0.189*	0.0559	0.191
	(0.065)	(0.0658)	(0.0980)	(0.0405)	(0.215)
Agriculture	0.0527	0.0356	-0.0571	-0.0254	-0.124
	(0.093)	(0.0997)	(0.0988)	(0.0429)	0.276)
Inflation	-0.00174	-0.00189	-0.00125	0.00758***	0.003
	(0.0035)	(0.00392)	(0.00275)	(0.00152)	(0.007)
GDP per capita	0.464***	0.490***	0.340***	-0.0448	1.36***
	(0.105)	(0.110)	(0.122)	(0.0581)	(0.373)
Debt (t-1)	-0.0289	-0.0293	0.00700	-0.0152	-0.001
	(0.0382)	(0.0394)	(0.0262)	(0.0115)	(0.0366)
Control of Corruption	0.155**	-	0.142**	-	-0.225
	(0.0639)	-	(0.0571)	-	(0.204)
Conflict (intensity level)	0.0282	0.0311	0.0323	0.00125	-
	(0.0345)	(0.0352)	(0.0342)	(0.0135)	-
Government Effectiveness		0.0389		0.0294	-
		(0.103)		(0.0449)	-
Constant	-1.641	-1.921*	-0.583	0.334	-6.814**
	(1.028)	(1.084)	(1.320)	(0.613)	(2.48)
Observations	126	126	180	175	34
Number of countries	77	77	111	108	13
R-squared	0.544	0.512	0.325	0.377	0.71
Time Fixed Effects	No	No			No

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Estimates of the Long-Run Impact of Technical Assistance on Tax Revenues (CS-ARDL)

	Full sample	Excl. Resource Rich	LICS
Variables	Long Run Coefficients		
Error Correction Term	-0.702***	-0.710***	-0.656***
	(0.036)	(0.0379)	(0.101)
TA	0.0383***	0.0179*	0.123***
	(0.009)	(0.01)	(0.019)
Openness	0.086***	0.052**	0.283***
	(0.019)	(0.022)	(0.033)
GDP per capita	0.145***	0.201***	-0.353***
	(0.036)	(0.039)	(0.118)
Constant	-0.541	0.318	-3.279**
	(0.561)	(0.541)	(1.302)
Observations	1,887	1,360	323
No. of Countries	111	80	19

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Income per capita and openness are found to also have a significant and positive impact in increasing tax revenues, underscoring global interconnectedness through the trade channel. The order of magnitude of the coefficients of these two variables is in line with the literature. The results further provide evidence that the control of corruption and improvements in the governance framework contribute to the improvement in tax revenues.

In the case of LICs, the study provides evidence that technical assistance contributes positively to the improvement in tax revenues. This group of countries, in addition to fragile states have the greatest need for capacity development given large infrastructure and institutional needs, pressing demand for public services and the need to build fiscal space and resilience to shocks.

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