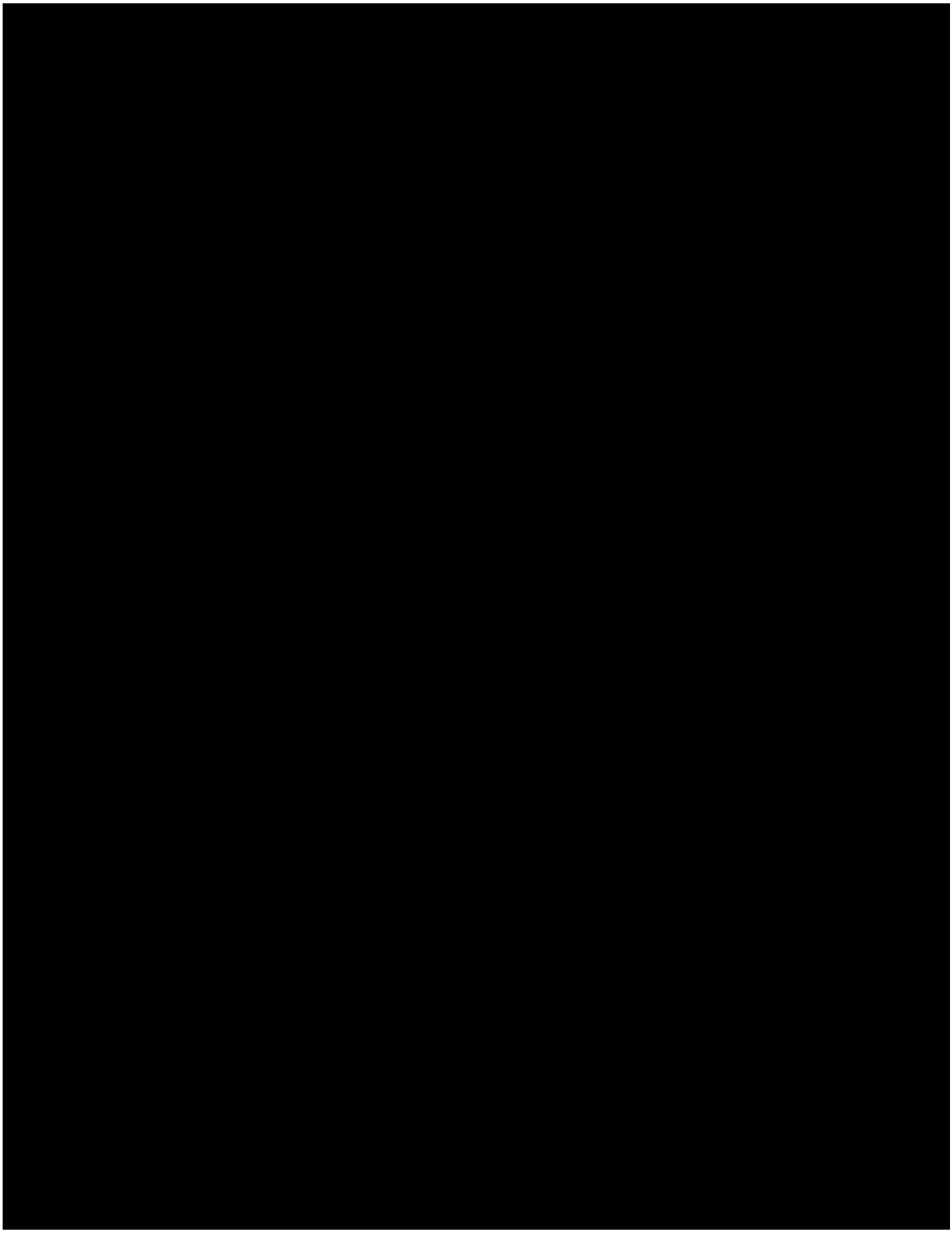


 WP/20/230

IMF Working Paper

African Department

External Private Financing and Domestic Revenue Mobilization: A Dilemma?

Prepared by Hippolyte Balima, Deirdre Daly, and Boileau Loko

Authorized for distribution by Boileau Loko

November 2020

Abstract[1]

Domestic revenue mobilization (DRM) is essential for low-income and emerging economies to sustainably finance their development needs and has received increasing attention in recent years. Studies have centered on structural factors such as the size and the structure of the economy, and the quality of institutions, notably to account for weaknesses in revenue administrations. Nevertheless, DRM can take time and carry political costs. Raising more financing through donors or private investors may be an easier and more politically palatable way for countries to meet spending needs. Using an impact assessment methodology and panel regressions over a sample of 72 developing countries, we found no evidence that access to bond markets or external commercial loans undermines the countries' efforts to collect tax revenue. On the contrary, we found that access to markets has a positive impact on domestic revenue mobilization. Plausible explanations are that private financing must be repaid, and strong macroeconomic fundamentals are key for maintaining market access. We have also found that macroeconomic stability and the strength of institutions do matter for domestic revenue mobilization.

JEL Classification Numbers: E6, G1, H2.

Keywords: Domestic revenue mobilization, Bond markets, external commercial debt.

[1] We are grateful to Charalambos Tsangarides, Marcos Poplawski Ribeiro, Flavien Moreau, Celine Allard, Lisandro Abrego, Rasmane Ouedraogo, Enrique Rojas, Jan Loeprick, Moustapha Mbohou Mama as well as participants of the AFR Fiscal Network seminar for helpful comments. We are also grateful to Felicite Adjahouinou and Jermaine Ogaja for formatting the paper.

I. INTRODUCTION

Domestic revenue mobilization (DRM) is essential for low-income and emerging economies to finance development needs, in order to sustain high and inclusive growth, while preserving debt and macroeconomic sustainability. Therefore, DRM has received increasing attention in recent years, leading to several papers on the factors that drive DRM in developing countries (Gupta et al., 2012). Studies have centered on structural factors such as the size and structure of the economy, and the quality of institutions, notably to account for the weaknesses of revenue administrations.

Nevertheless, DRM can take time, requiring difficult political reforms to improve governance and tax administration. It may also have redistributive consequences with potential political and economic costs. For instance, Chen et al. (2019) found that a percentage point of GDP tax consolidation lowers the probability of the reelection of the incumbent government by about 8 percentage points. Indeed, in many developing countries, increasing domestic revenue by expanding the tax base may require reducing tax exemptions usually granted to powerful local and international firms. Many developing countries may be also reluctant to do this as they consider tax exemptions essential for attracting FDI and diversifying their economies.

Raising more financing, through donors or private investors, may be an easier and more politically palatable way for countries to meet spending needs. In this connection, great attention has been paid to the interaction between aid and DRM. While one view is that aid may discourage tax efforts if seen as a politically less costly source of revenue, another view is that aid can be used to finance revenue-generated reforms through promoting growth, encouraging more efficient tax structures, and supporting reforms to revenue administration. Empirical studies have not been able to provide a clear answer. Several studies found that aid discourages domestic revenue mobilization, particularly in countries with weak institutions (Gupta et al., 2003). At the same time, other studies have concluded that aid may be favorable to domestic revenue mobilization, particularly in the cases where aid is conditional on implementation of good policies and structural reforms (Clist and Morrissey, 2011). To further explore the question, some authors differentiated between grants and official loans. They generally found that grants tend to have a negative impact (Ghura, 1998; Gupta et al., 2003), particularly in countries with high levels of corruption.

Less attention has been paid to the impact of financing from external private sources (sovereign bond markets and commercial loans) on DRM. Private creditors have become an increasingly important source of financing in low-income and emerging economies owing both to commercial creditors' increased willingness to lend and a declining supply of grant-financing.[2] For instance, sovereign bond issuances in emerging and developing markets have also increased significantly over the recent period, with annual issuances of at least US$100 billion between 2012 and 2018. Issuances have increased not only for emerging

[2] See for example *Evolution of Public Debt Vulnerabilities in Lower Income Economies* (SM/19/292).

economies, but also for many low-income countries. Several low-income countries, including 16 African countries, have issued sovereign bonds in the last past ten years.

Like aid, increased external private financing may disincentivize DRM if viewed as easier to obtain and politically less costly source of revenue. However access to private financing may also incentivize fiscal discipline, indirectly affecting revenue mobilization and other reforms.[3] According to the Market Discipline Hypothesis (MDH), financial markets can discipline government finances through the response of the sovereign debt risk premium to higher deficits or public debt, demanding higher interest rates or, in the extreme, denying access to financing (Bishop et. al 1989; Lane 1993).[4] Evidence to support the MDH has been found in studies of advanced economies (Ardagna et al., 2007), U.S. states (Bayoumi et al., 1995), and developing economies (Bulut, 2012). Finally, in line with the literature on aid and DRM, it can also be argued that private financing would be used more effectively than grants and concessional loans as they are more expensive.

This paper tries to answer the empirical question of whether access to private financing affects low-income and emerging market economies' ability to collect revenue. We focus on external private financing in the form of bond and commercial loans rather than domestic private financing, since it is provided on a voluntary basis unlike domestic banks and bond financing, which may be government directed (IMF 2010)[5]. Raising external private financing also does not have the potential economic cost of crowding out the private sector.

So far, only a few empirical studies have looked at the links between private forms of external financing and DRM. Using a sample of 119 developing countries over 1985–2012, Balima et al. (2016) found that the existence of a long-maturity bond issuance significantly encourages governments in developing countries to improve their tax revenue mobilization. However, in addition to not capturing changes in the international context since the resolution of the 2008 financial crisis, Balima et al. focused exclusively on the bond market—therefore excluding commercial loans. Our analysis uses a broader concept of market access that includes external commercial loans and covers a sample of 72 emerging market and developing economies over 2004–18. By extending the coverage to cover the period 2004–18, we choose to focus exclusively on the period characterized by a rapid increase in sovereign bond issuances by developing countries, including low-income countries (LICs).

Given that our research question is mainly empirical, we rely on different estimation methodologies. In our benchmark empirical approach, we employ the entropy balancing methodology, a generalization of conventional matching methods proposed by Hainmueller

[3] For example, efforts to mobilize revenues are frequently cited in Eurobond prospectuses. Countries such as Côte d'Ivoire, Gabon and Senegal were able to access markets in recent years , in the context of a policy agenda including strong revenue mobilization efforts.

[4] An analogy could be drawn to the free-cash flow hypothesis in corporate finance that argues that debt serves as a disciplining device on managers.

[5] It is worth noting that both external bonds and external commercial loans are used in the IMF's market access criterion for determining eligibility for graduation from eligibility for using PRGT resources.

(2012). While the relative performance of entropy balancing—compared to alternative methods—will be closely discussed in detail in the methodological section, this method allows us to identify the effect of market access by comparing market access and non-market access countries that are as similar as possible in terms of observable characteristics, after purging for the influence of unobservable factors. In robustness checks, we rely on panel fixed effect and GMM estimations. Our results suggest no evidence that access to bond markets or external commercial loans undermines the countries' efforts to collect tax revenue. On the contrary, we found that access to markets has a positive impact on domestic revenue mobilization. However, given mounting concerns over the sustainability of public debt in many countries, our paper rather contributes to the "wake-up call" for low-income and emerging market economies to continue enhancing tax administration and policy to increase domestic revenue mobilization. They also need to continue strengthening debt management practices for managing debt risks, including those related to market access and particularly exchange rate and interest rate risks.

The rest of the paper is organized as follows. Section II presents the data with some descriptive statistics. Section III reports the empirical specifications and results. Section IV explores potential heterogeneities and section VI concludes.

II. DATA

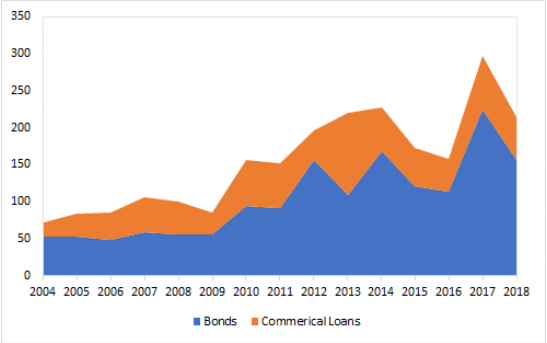
The dataset comprises a balanced panel of 72 emerging market and developing economies over 2004–2018 (see Annex Table A1). Our sample differs from Balima et al. (2016) due to data availability particularly on bond issuances and external commercial debt borrowings.[6] We focus exclusively on this period to account for the recent rapid increase in sovereign bonds issuance by developing countries. Data on tax revenues are drawn from the IMF World Economic Outlook. Data on international bond market issuance and disbursements of external commercial debt are based on data from the World Bank's International Debt Statistics (IDS) database.[7]

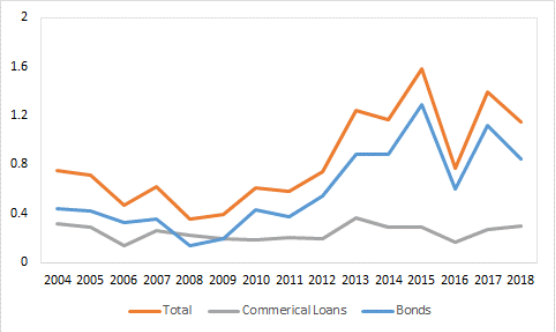
Figure 1. Evolution of Private Financing in Emerging Market and Developing Countries 2004–18[1]

Total (billions USD) Average (Percent of GDP)

[6] Balima et al. (2016) rely solely on a treatment dummy variable while our analysis also looks at the amounts.

[7] Coverage includes public and publicly guaranteed debt, although individual countries may differ with some unable to report beyond central government debt.

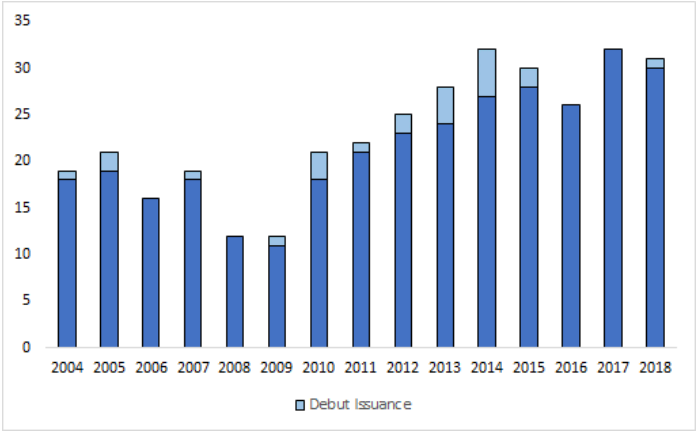




Source: World Bank IDS.
1. Dataset based on 72 emerging market and developing countries. Private financing refers to disbursements of international bonds and external commercial loans.

The amount of private financing (disbursements from international bond market issuance and external commercial debt) borrowed by the countries in the dataset has risen from USD 72 billion in 2004 to a peak of US$ 296 billion in 2017 (Figure 1). This increase has been driven mainly by a rise in international bonds. The number of countries issuing bonds increased from an average of 18 per year in the first three years of the sample period (i.e., 2004–6) to an average of 29 countries per year in the last three years of the sample period (Figure 2). Over 2004–18, twenty-four countries in the sample gained market access via a debut bond market issuance[8], 21 of which made subsequent issues in the years following their debut. The size of these debut issuances has averaged 2.7 percent of GDP, compared with the sample average of all issues at 1.8 percent of GDP.

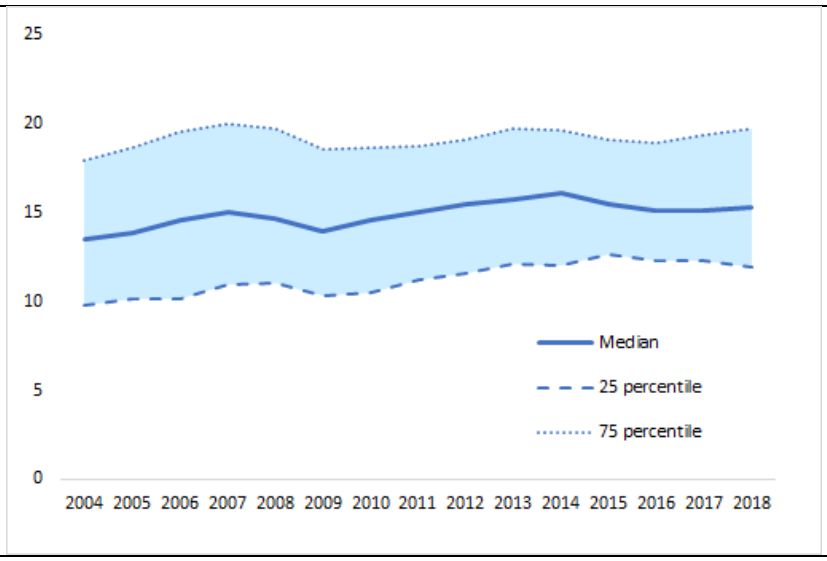
Figure 2. Number of Countries Issuing Bonds 2004–18[1]



Sources: World Bank IDS, Dealogic.
1. Dataset based on 72 emerging market and developing countries.

Figure 3. Median Tax Revenue (percent of GDP) 2004–18[1]

[8] Eight other countries also had debut bond market issuance issuances during 2004–2018, but are not included in the sample owing to data limitations. There countries are: Georgia, Maldives, Mongolia, Namibia, Rwanda, Sri Lanka, Suriname, and Tajikistan,



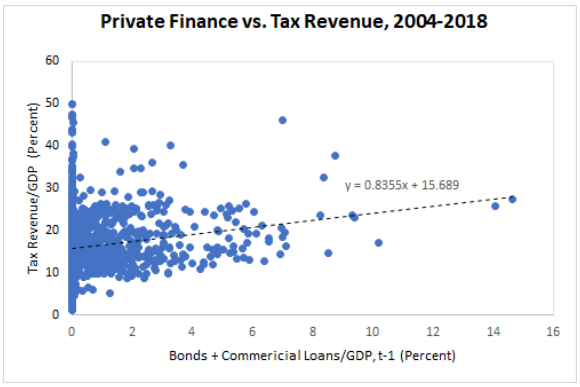
Source: IMF WEO.
1. Dataset based on 72 emerging market and developing countries.

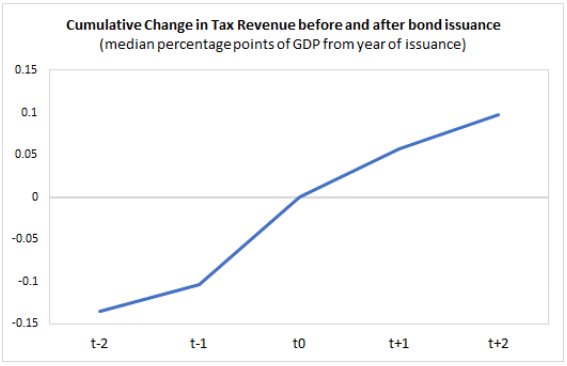
Table 1. Average Tax Revenue to GDP 2016-18 by Country Characteristics[1]

	Average Tax Rev/GDP	No. Countries in Sample
Income Group		
Emerging Market	16.5	53
Low-income Country	13.1	19
Exporter Type		
Commodity	14.7	27
Non-commodity	16.2	45
Issuer Type[2]		
Regular Issuer	19.2	31
Occasional Issuer	15.6	18
Non-Issuer	13.4	25
Region		
Sub-Saharan Africa	14.2	27
Asia-Pacific	14.1	12
MENA	14.2	8
Latin America-Caribbean	16.8	16
Europe	21.3	9
All Countries	15.6	72

Source: IMF WEO
1. Dataset based on 72 emerging market and developing countries.
2. Regular issuer issued on international bond markets for at least 2/3 of the sample years (>9 years over 2004-2018); occasional issuer issued on international bond markets in less than 2/3 of the sample years. Non-Issuers did not issue during the sample period.

Figure 4. Tax Revenue and Financing[1]





Sources: IMF WEO, World Bank IDS.
1. LHS chart based on 71 emerging market and developing countries (excludes outlier Belize). RHS based on 228 issuances in sample over 2004–16 for which data are available).

Tax revenue as a share of GDP has only seen modest growth over the sample period, rising from a median level of 13.7 percent of GDP in 2013 to 15.3 percent of GDP in 2018 (Figure 3). Table 1 compares average tax revenue ratios across various country groups for the last three years of the sample. Higher income emerging market economies typically have higher revenue ratios than low-income countries. Commodity exporters have had lower tax revenue ratios than non-commodity exporters, though the reverse is the case in the years 2005–2013 when commodity prices were higher. Countries that have issued bonds more regularly (at least two thirds of the sample years) have higher tax ratios averaging 19.4 percent of GDP, compared with occasional issuers (15.6 percent of GDP) and non-issuers (13.4 percent of GDP).

Tax levels are positively correlated with the level of private financing (bonds and external commercial loans as a share of GDP) from the previous year (Figure 4). Tax levels also tend to increase following bond market issuances with a median cumulative change of almost 0.1 percentage points of GDP in the two years following. However, this is somewhat lower than the sample median annual change of 0.2 percentage points of GDP.

A comparison of tax levels in the sample with some of the key determinants identified in the literature shows that tax performance appears to be positively correlated with per-capita-GDP[9], trade openness and quality of institutions—proxied using the International Country Risk Guide (ICRG) political risk score; and negatively correlated with foreign aid, the size of the agricultural sector, and inflation (Figure 5).

[9] It is worth noting that some studies have also found the relationship can work in the other direction: Gaspar et. al (2016) that a tax ratio of 12.75 percent of GDP represents a tipping point associated with a significant acceleration in the process of growth and development. A country just above this threshold will have a GDP per capita 7.5 percent larger, after 10 years.

Figure 5. Tax Revenue Correlation with Key Determinants

Source: IMF WEO, International Country Risk Guide.

III. ESTIMATION STRATEGY AND RESULTS

A key challenge to estimating the relationship between market access and tax revenues is the problem of reverse causality—and endogeneity more broadly—given that provision of market financing may be influenced by the level of taxation. Access to market may reflect fiscal discipline and, by extension, the borrowing country's creditworthiness. A common identification approach is to find external instruments that explain countries' decisions to

bridge their financing gaps using market financing but do not affect their DRM effort. However, finding a suitable instrument for market access that is reasonably exogenous to fiscal policy is difficult. For instance, some of the identified "push" factors in the literature—that drive issuance in emerging market and developing countries (e.g. low interest rates in advanced economies)—may not be fully exogeneous to DRM efforts as they may affect donors' aid decisions as well as local economic conditions (Uribe and Yue, 2006; Fuchs et al., 2014). Many of the "pull" factors that drive issuance—including the level of income per capita or the quality of institutions—also influence tax revenues (Gupta, 2007; Presbitero et al., 2016). To overcome the endogeneity issue, we start by assessing the effect of market access on DRM using an impact assessment methodology. In robustness checks, we also use panel fixed effects and GMM estimations.

A. Impact Assessment

Methodology

In the impact assessment approach, we transform the market access variable—the amount of international bond issued, and external commercial debt borrowed—into a dummy variable. The dummy variable takes the value of 1 if a country issues international bonds or borrows contracts external commercial debt in a given year and of zero otherwise. We consider the market access dummy as the treatment variable and the measure of DRM (tax revenue-to-GDP) as the outcome variable. Transforming the market access variable into a dummy allows us to compare market access and non-market assess countries using the impact assessment approach, even though some information is lost regarding the quantitative and qualitative types of external financing. Our units of analysis are country-year observations. Observations with market access represent the treatment group while those without market access correspond to the control group. The measure of interest to estimate is the well-known average treatment effect on the treated, $\boldsymbol{\tau}$, defined as

$$\boldsymbol{\tau} = \boldsymbol{E}\left[\boldsymbol{DRM}_{(\mathbf{1})} \middle| \boldsymbol{MA} = \mathbf{1}\right] - \boldsymbol{E}\left[\boldsymbol{DRM}_{(\mathbf{0})} \middle| \boldsymbol{MA} = \mathbf{1}\right] \qquad (1)$$

where $\boldsymbol{DRM}_{(.)}$ is the outcome variable, that is, the level of domestic revenue mobilization; $\boldsymbol{MA}$ indicates if the unit of observation is subject to the treatment *market access* ($\boldsymbol{MA} = \mathbf{1}$) or eventually not ($\boldsymbol{MA} = \mathbf{0}$). Consequently, $\boldsymbol{E}\left[\boldsymbol{DRM}_{(\mathbf{1})} \middle| \boldsymbol{MA} = \mathbf{1}\right]$ is the level of domestic revenue mobilization in market access country observations and $\boldsymbol{E}\left[\boldsymbol{DRM}_{(\mathbf{0})} \middle| \boldsymbol{MA} = \mathbf{1}\right]$ is the counterfactual outcome for countries that experienced market access (i.e. the level of domestic revenue mobilization in market access country observations if they had not experienced market access). Given that we cannot observe the latter, we need to find an appropriate proxy. For instance, if a country's access to markets is a random event, we can easily identify $\boldsymbol{\tau}$ by comparing DRM in market access and non-market access countries. However, a country's access to markets is rather endogenous to several "push" and "pull" factors. To overcome this issue, we match market access and non-market access units that are as close as possible with respect to pretreatment characteristics that meet the following two conditions: (i) they are correlated with market access and (ii) they are associated with DRM.

Under the condition that the non-market access units are close to the market access units, differences in DRM between the two-unit groups could be attributed to market access.

We rely on the entropy balancing approach, a generalization of conventional matching methods proposed by Hainmueller (2012) to overcome the counterfactual and endogeneity issues with regard to impact assessments—here market access. The method allows us to select non-treated observations for units exposed to treatment and to estimate $\boldsymbol{\tau}$. More specifically, it allows us to identify the effect of market access by comparing market access and non-market access countries that are as similar as possible in terms of observable characteristics—the matching covariates, after purging the influence of unobservable factors. Entropy balancing has been widely used in recent studies. For instance, Neuenkirch and Neumeier (2016) used the entropy balancing to analyze the effect of US sanctions on poverty; Balima et al. (2018) employed it to evaluate the effect of credit default swaps initiation on the occurrence of sovereign debt crises; and Balima and Sy (2019) used this methodology to access the impact of bailouts on the probability of sovereign debt crises.

We consider a set of matching covariates drawn from previous studies on the determinants of tax effort and market access (Ghura, 1998; Gupta, 2007; Baunsgaard and Keen, 2010; Gelos et al., 2011; Lledo and Poplawski-Ribeiro, 2013; Benedek et al., 2014). These covariates are GDP per capita, agriculture value-added, trade openness, institutional quality, foreign aid, and inflation. All the covariates are lagged by a year to reduce a potential simultaneity bias. The overall development of the economy measured by GDP per capita is expected to show a positive correlation with tax revenue due to the higher degree of economic and institutional sophistication. A higher share of agriculture is expected to be negatively associated with tax revenues given this sector is often more difficult to tax (e.g., subsistence farming). Trade openness as measured as the sum of imports and exports over GDP may present either sign. Trade taxes may be easier to collect resulting in a positive sign, but trade openness may also have been achieved through reduced tariffs, suggesting a negative effect (Baunsgaard and Keen, 2010). The quality of institutions is proxied by the International Country Risk Guide (ICRG) Political Risk index (ranging from zero to 100, reflecting highest risk to low risk) and expected to have a positive correlation. Foreign aid as measured by the level of budgetary grants as a percent of GDP may present either sign as it could discourage tax effort but may also help finance revenue-generating reforms (McGillivray and Morrissey, 2004; Clist and Morrissey, 2011). Inflation rate is included to capture macroeconomic stability and is expected to have a negative effect on DRM (Gupta et al., 2003). These covariates may also affect market access somewhat in a similar direction as they affect DRM (Gelos et al., 2011; Presbitero et al., 2016).

In using the entropy balancing, our goal is to reweight the control group to match the moments of the treatment group. Therefore, we can estimate equation (1) using the difference in mean outcomes between the market access group and the reweighted non-market access group. The counterfactual mean may be estimated as follows

$$E[\widehat{DRM(0)|MA} = 1] = \frac{\sum_{\{i|MA=0\}} DRM_i \, w_i}{\sum_{\{i|MA=0\}} w_i} \qquad (2)$$

w_i in equation (2) represents the weight chosen for each non-market access unit. These weights are obtained by solving the loss function $H(w)$ below:

$$\min_{w_i} H(w) = \sum_{\{i|MA=0\}} h(wi) \quad (3)$$

under the constraints

$$\sum_{\{i|MA=0\}} w_i \, C_{ri}(X_i) = m_r \text{ with } r \in 1, \ldots, R \text{ and} \quad (4)$$

$$\sum_{\{i|MA=0\}} w_i = 1 \text{ and} \quad (5)$$

$w_i \geq 0$ for all i such that $D = 0$, (6)

$h(.)$ in the above represents a distance metric, X_i is the set of covariates discussed in the previous paragraph as determinants of both tax effort and market access and $C_{ri}(X_i)$ corresponds to a set of balance constraints imposed on the reweighted non-market access group X_i's moments.

The entropy balancing weights are therefore estimated by minimizing equation (3) under the constraints in equations (4-6). Relying on a vector of Lagrange multipliers for the balance and the normalization constraints ($Z = \{\lambda_1, \ldots, \lambda_R)'$ and $\lambda_0 - 1$, respectively), the optimization problem becomes:

$$\min_{W,\lambda_0,Z} L^p = \sum_{\{i|MA=0\}} w_i \, log(w_i/q_i) + \sum_{r=1}^{R} \lambda_r \left(\sum_{\{i|MA=0\}} w_i C_{ri}(X_i) - m_r\right) + (\lambda_0 - 1) \left(\sum_{\{i|MA=0\}} w_i - 1\right), \quad (7)$$

We can solve the system of equations by exploiting the convexity of the loss function and by substituting out the constraints. Doing so, the solution for each weight is attained by

$$w_i^* = \frac{q_i \, exp\left(-\sum_{r=1}^{R} \lambda_r C_{ri}(X_i)\right)}{\sum_{\{i|MA=0\}} q_i \, exp\left(-\sum_{r=1}^{R} \lambda_r C_{ri}(X_i)\right)} \quad (8)$$

Empirically, these weights can be estimated as a log-linear function of the X_i specified in the moment conditions. In the entropy balancing's practical implementation, we rely on two consecutive steps. In a first step, we follow Neuenkirch and Neumeier (2016) and choose the balance constraints that impose equal pretreatment covariate means across the treated and the non-treated groups. This allows to ensure that the non-treated group contains, on average, units not subject to treatment that are as similar as possible to the treated units. In a second step, we use the weights in a regression analysis with the level of domestic revenue mobilization as the dependent variable and market access dummy as the explanatory variable. We then obtain the average treatment effect of market access on domestic revenue mobilization, that is, the estimated parameter of market access in the regression analysis.

Since it combines both matching (in its first step) and regression (in its second step), entropy balancing has many advantages over other treatment effect estimators or regression analyses (Hainmueller, 2012). First, it allows us to obtain a high degree of covariate balance between

treated and non-treated groups by creating a synthetic control group which corresponds to a virtually comparable image of the treated group.[10] For instance, with conventional matching methods, each untreated unit either receives a weight equal to 0, in the event it does not represent a best match for a treated unit, or equal to 1, in the event it does represent a best match for one treated unit. However, with a limited number of untreated units and a large number of pretreatment characteristics, this procedure does not guarantee a sufficient balance of pretreatment characteristics across the treatment and control groups. This is problematic as a low covariate balance may lead to biased treatment effect estimates. In contrast, with entropy balancing, the vector of weights assigned to the units not exposed to the treatment can contain nonnegative values. Thus, a synthetic control group is designed to represent a comparable image of the treatment group. Therefore, entropy balancing can be interpreted as a generalization of conventional matching approaches.

Second, compared with regression-based approaches (namely difference-in-difference or OLS) or conventional matching methods (including propensity scores matching and bias-corrected matching), the method is non-parametric—meaning that it does not require to specify an empirical model for the selection to market access or the outcome variable. This feature makes it possible to minimize potential problems of misspecifications like those arising when choosing a functional form of an empirical model. In contrast to regression-based analyses, the entropy balancing estimates do not suffer from multicollinearity because its reweighting scheme orthogonalizes the covariates with respect to the treatment measure. Third, compared with conventional matching such as bias corrected matching or nearest neighbor matching where control units are either discarded or matched, the entropy balancing uses a more flexible reweighting scheme. It reweights the units with the goal of achieving a balance while keeping at the same time the weights as close as possible to the base weights, to avoid a loss of information. Finally, while conventional matching methods and pooled probit models rely on the conditional independence assumption (that is, conditional to the vector of observable covariates, the treatment is independent of unobservable), the entropy balancing allows to consider the panel dimension of the data by controlling for country and time specific factors in the regression analysis.[11]

Results

Table 2 reports the pre-weighting sample means of all covariates for the market access group (column [1]) and the non-market access group (column [2]), as well as differences in covariates' means (columns [3]). The tests in column [3] suggest that market access countries receive lower grants, have higher GDP per capita and institutional quality, and have lower agriculture value added-to-GDP and inflation rate, compared with non-market access countries; suggesting the need to modify the control group to make it comparable to the treated group. The modified (synthetic) control group is reported in column [4], together with

[10]Hainmueller (2012), in a Monte Carlo simulation, compares the performances of entropy balancing to other alternative impact assessment methodologies, including propensity score matching and genetic matching. He concludes that entropy balancing outperforms these alternative methodologies in terms of estimation bias and mean square error.

[11] We use regional fixed effects rather than country fixed effects as some countries did not have market access over the sample period.

covariates' means differences with respect to the market access group (column [5]). Column [5] reveals the effectiveness of entropy balancing: no significant differences remain after weighting as the synthetic and the market access groups present statistically equal covariates' means.

In Table 3, we report the average treatment effect of market access on DRM, drawing upon the synthetic control group computed in Table 2. Column [1] of Table 3 presents the results of the second step of entropy balancing without the matching covariates included in the second step. Column [2] includes these matching covariates in the second step of the regression. columns [3] and [4] subsequently add year- and regional-fixed effects, respectively. Irrespective of the specification, the results show that the estimated average treatment effect of market access on DRM is positive and statistically significant. Similar to Balima et al. (2016)—see Annex Table A2—we find that, during the period 2004–18, between two market and non-market access countries that have comparable characteristics, the one with a market access has higher tax revenue mobilization effort. More importantly, the average magnitude of the estimated treatment effect is economically meaningful, of about 1 percentage point of GDP on average. However, the magnitudes of the estimates in Table 3 are somewhat lower compared to Balima et al. (2016)'.

Table 2: Entropy Balancing's First Step Descriptive Statistics

	[1]	[2]	[3] = [2] - [1]			[4] Synthetic Group	[5] = [4] - [1]		
	Market Access	No Market Access	Difference	t-test	p-val.	No Market Access	Difference	t-test	p-val.
Grants-to-GDP (t-1)	2.538	3.883	1.345	3.545	0.000	2.355	-0.183	-1.449	0.148
GDP per capita, log (t-1)	8.041	7.071	-0.969	-20.411	0.000	8.103	0.062	1.171	0.242
Trade openness, log (t-1)	4.288	4.262	-0.026	-1.220	0.222	4.290	0.002	0.091	0.928
Agriculture-to-GDP (t-1)	22.434	22.343	9.909	17.213	0.000	21.664	-0.770	-1.378	0.169
Political risk (t-1)	67.403	61.976	-5.426	-12.492	0.000	67.707	0.304	0.720	0.471
Inflation (t-1)	6.368	7.190	0.822	1.882	0.060	6.294	-0.074	-0.157	0.875
Observations	832	681							

Notes: This Table presents the pre-weighting sample means of the matching covariates for country-year observations with market access (the treatment group) in column [1], and country-year observations with no market access (the potential control group) in column [2]. Column [3] reports the differences in means between treated and control group before weighting, and the corresponding t-test statistics and p-values. Column [4] reports the synthetic control group means matching covariates obtained from entropy balancing after weighting. Column [5] shows the differences in means, the t-test statistics and the associated p-values between treated and synthetic control groups.

Table 3: The Effect of Market Access and DRM—Entropy Balancing

	[1]	[2]	[3]	[4]
Market Access dummy	1.044 **	0.943 ***	0.928 ***	1.114 ***
	(0.444)	(0.352)	(0.353)	(0.354)
Covariates in the second step	No	Yes	Yes	Yes
Year fixed effect in the second step	No	No	Yes	Yes
Regional fixed effect in the second step	No	No	No	Yes
R2	0.005	0.381	0.387	0.416
Observations	1,021	1,021	1,021	1,021

Notes: This Table presents the effect of Market Access on DRM obtained by weighted least squares regressions. The treatment variable is the market access dummy. The outcome variable is tax revenue-to-GDP. Column [1] reports the result without the matching covariates in the second step of the entropy balancing. Column [2] brings the covariates to the regression. Columns [3] and [4] subsequently add year and regional fixed-effects into the regressions. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Robustness Checks

We perform alternative specifications of the entropy balancing as follows. First, to account for potential omission bias, we introduce additional covariates that may affect both countries' market access and DRM. These variables capture key dimensions of a country's cyclical capacity to honor its debt obligations (GDP growth and trading partners' GDP growth), structural features (industry value added-to-GDP, natural resources rents-to-GDP, total population), fiscal policy (fiscal balance-to-GDP, debt service-to-GNI, IMF program dummy), external viability (reserves in months of imports), and political economic factors (executive election dummy). These additional covariates are added subsequently to the entropy balancing second step regressions. The results reported in Table 4 confirm our baseline finding. The estimate effect is positive in all columns, although the average magnitude of the estimate is somewhat higher than the baseline result.

Second, we consider the alternative definition of the treatment variable—our market access dummy. In column [1] of Table 5, the treatment variable equals to 1 if market financing is above a standard deviation of each country's specific distribution, and to 0 otherwise. Column [2] of Table 5 defines a treatment variable equals to 1 if market financing is above the 30^{th} percentile of the sample distribution of non-null observations, and to 0 otherwise. In both columns, the main conclusion does not change.

Third, we check if the result holds for additional specified moment conditions of the reweighted data obtained from the entropy balancing. In column [3] of Table 5, we reweighted the control units to satisfy the balance constraints that the 1st and the 2nd moments—means and variances—match the corresponding moments of the treated units. In column [4] of Table 5, the reweighting scheme considers the 1st, the 2nd, and the 3rd moments—means, variances, and skewness—of the control units. The estimated effects reported in both columns remain positive and statistically significant. Using additional moment conditions confirms the previous finding.

Table 4: The effect of Market Access and DRM—alternative specifications of the entropy balancing.										
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
	GDP growth	Trading partners GDP	Industry value-added	Natural resources rents	Reserves	Fiscal balance	Debt service-to-GNI	Total population (log)	Executive election	IMF program
Market Access dummy	1.027 ***	1.006 ***	0.991 ***	1.320 ***	2.884 ***	3.663 ***	3.913 ***	3.459 ***	3.358 ***	3.318 ***
	(0.362)	(0.363)	(0.365)	(0.369)	(0.317)	(0.389)	(0.385)	(0.416)	(0.443)	(0.444)
Covariates in the second step	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect in the second step	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional fixed effect in the second step	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R2	0.411	0.413	0.414	0.458	0.677	0.667	0.68	0.685	0.690	0.691
Observations	978	970	968	899	783	523	523	523	480	480

Notes: This Table presents the effect of Market Access on DRM obtained by weighted least squares regressions, adding subsequently additional covariates. The treatment variable is the market access dummy. The outcome variable is tax revenue-to-GDP. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: The Effect of Market Access And DRM—Alternative Specifications of the Entropy Balancing.				
	[1]	[2]	[3]	[4]
Market Access dummy	1.263 ***	0.969 ***	1.633 ***	1.829 ***
	(0.370)	(0.359)	(0.355)	(0.348)
Covariates in the second step	Yes	Yes	Yes	Yes
Year fixed effect in the second step	Yes	Yes	Yes	Yes
Regional fixed effect in the second step	Yes	Yes	Yes	Yes
R2	0.334	0.445	0.383	0.389
Observations	1,007	1,007	1,007	1,007

Notes: This Table presents the effect of market access on DRM obtained by weighted least squares regressions using alternative specifications. The treatment variable is the market access dummy. The outcome variable is tax revenue-to-GDP. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

B. Panel Regression Specification

We also explore the robustness of our main finding using a panel regression specification. The approach consists of first estimating the following equation:

$$T_{it} = \alpha_i + \beta_1 MADummy_{it-1} + \beta_2 X_{it-1} + \varepsilon_i \qquad (1)$$

Where T_{it} denotes tax revenues in country i at time t, expressed relative to GDP; $MADummy$ is the market access dummy used in the impact assessment approach. We consider the set of control variables used in the baseline impact assessment approach, drawn from previous studies on the determinants of tax effort.

The panel specification also allows to consider a continuous measure of market access by estimating the equation:

$$T_{it} = \alpha_i + \beta_1 MALevel_{it-1} + \beta_2 X_{it-1} + \varepsilon_i \qquad (2)$$

Where, $MALevel$ is the amount of external bonds and commercial financing as a share of GDP.

Equations 1 and 2 are first estimated on the full sample with panel regressions that include country and times fixed effects and using both the log and level of tax revenue-to-GDP ratios as the dependent variable. We also estimate equations 1 and 2 using the difference GMM and the system-GMM. The system-GMM equation estimates the differenced and levels as a system, using lagged changes of the control variables as instruments in the latter and lagged levels as instruments in the former. Again, we conduct the analysis for the full sample and report the Hansen statistics of over-identifying restrictions.

The panel regressions (Table 6 and table 7) provide some support for the baseline finding that market access is positively correlated with DRM, although the estimated positive effects are not statistically significant in most cases. In addition, the panel regressions' estimates are somewhat smaller than the matching's estimate, as the former imposed a functional form restriction. Consequently, our entropy balancing estimates do not suffer from multicollinearity, as the reweighting scheme orthogonalizes the covariates with respect to the market access indicator, whereas panel regression-based estimates are prone to multicollinearity.

Table 6. Fixed Effects Regression Results[1]

Dep. Variable	(1) Tax rev (log)	(2) Tax Rev (level)	(3) Tax rev (log)	(4) Tax Rev (level)	(5) Tax rev (log)	(6) Tax Rev (level)	(7) Tax rev (log)	(8) Tax Rev (level)
Market access dummy (t-1)	-0.008	0.425	0.021	0.768				
	(0.73)	(0.33)	(0.41)	(0.15)				
Private finance/GDP (t-1)[2]					0.007	0.201**	0.008*	0.206*
					(0.13)	(0.03)	(0.08)	(0.05)
Grants/GDP (t-1)	0.003	-0.001	0.001	-0.011	0.003	-0.003	0.001	-0.012
	(0.23)	(0.96)	(0.61)	(0.55)	(0.24)	(0.88)	(0.61)	(0.54)
GDP per capita, log (t-1)	0.121	-0.200	0.022	-0.869	0.123	-0.084	0.029	-0.666
	(0.15)	(0.81)	(0.83)	(0.44)	(0.14)	(0.92)	(0.77)	(0.55)
Trade openness, log (t-1)	0.563***	5.820***	0.496***	5.287***	0.562***	5.757***	0.492***	5.184***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)
Agriculture/GDP (t-1)	-0.005	-0.080	0.004*	-0.041	-0.005	-0.079	0.004*	-0.041
	(0.43)	(0.13)	(0.07)	(0.39)	(0.44)	(0.14)	(0.07)	(0.39)
Political risk (t-1)	0.013**	0.147***	0.008**	0.135*	0.013**	0.146***	0.008**	0.136*
	(0.01)	(0.01)	(0.02)	(0.05)	(0.01)	(0.01)	(0.02)	(0.06)
Inflation (t-1)	0.002*	0.006	0.000	-0.011	0.002*	0.004	0.000	-0.014
	(0.06)	(0.59)	(0.79)	(0.67)	(0.08)	(0.71)	(0.86)	(0.56)
IMF program dummy	0.031*	0.398	0.015	0.328	0.032**	0.406	0.016	0.339
	(0.05)	(0.14)	(0.34)	(0.30)	(0.05)	(0.14)	(0.33)	(0.30)
Growth of trading partners (t-1)	-0.004	0.010	-0.002	-0.001	-0.004	0.006	-0.002	-0.008
	(0.11)	(0.79)	(0.29)	(0.97)	(0.11)	(0.86)	(0.23)	(0.82)
Total debt/GDP (t-1)	-0.000	-0.001			-0.000	-0.001		
	(0.60)	(0.81)			(0.58)	(0.77)		
External debt/GDP (t-1)			-0.001***	-0.005			-0.001***	-0.004
			(0.00)	(0.23)			(0.00)	(0.27)
Domestic debt/GDP (t-1)			-0.002	0.004			-0.002	0.004
			(0.43)	(0.88)			(0.43)	(0.88)
Constant	-1.324	-15.355	-0.049	-7.506	-1.350	-15.934	-0.082	-8.423
	(0.26)	(0.15)	(0.97)	(0.58)	(0.24)	(0.13)	(0.95)	(0.54)
R2	0.367	0.272	0.397	0.243	0.369	0.281	0.400	0.245
Observations	983.000	983.000	777.000	777.000	983.000	983.000	777.000	777.000
Countries	72	72	58	58	72	72	58	58

1/Dependent variable is total tax revenue to GDP (logs and level). Regressions include country and year fixed effects. P-values based on robust standard errors in parenthesis; ***(**,*) indicate significance at 1 (5,10) percent.

Table 7. GMM Regression Results[1]

Dep. Variable	(1) Difference Tax rev (log)	(2) System Tax rev (log)	(3) Difference Tax rev (level)	(4) System Tax rev (level)	(5) Difference Tax rev (log)	(6) System Tax rev (log)	(7) Difference Tax rev (level)	(8) System Tax rev (level)
Tax rev, log (t-1)	0.83***		1.31***		0.80***		1.29***	
	(0.00)		(0.00)		(0.00)		(0.00)	
Tax rev, level (t-1)		1.10***		1.04***		1.06***		1.02***
		(0.00)		(0.00)		(0.00)		(0.00)
Market access dummy (t-1)	-0.03	-0.17	-0.01	-0.20				
	(0.41)	(0.48)	(0.61)	(0.34)				
Private finance/GDP (t-1)[2]					-0.00	0.10*	0.00	-0.18
					(0.99)	(0.06)	(0.23)	(0.75)
Grants/GDP (t-1)	0.01	0.03	-0.00	-0.03	0.00	0.02	-0.01	0.02
	(0.12)	(0.14)	(0.55)	(0.47)	(0.57)	(0.19)	(0.41)	(0.29)
GDP per capita, log (t-1)	-0.54	-2.73*	-0.01	-0.12	0.00	-2.05*	-0.02	0.02
	(0.30)	(0.06)	(0.55)	(0.42)	(0.97)	(0.10)	(0.46)	(0.91)
Trade openness, log (t-1)	-0.50	-2.47**	-0.11*	-0.30	-0.05	-2.24**	-0.10*	0.51*
	(0.55)	(0.02)	(0.09)	(0.62)	(0.69)	(0.03)	(0.10)	(0.10)
Agriculture/GDP (t-1)	-0.03	0.09***	0.00	0.00	0.00*	0.08***	0.00	-0.01
	(0.41)	(0.01)	(0.16)	(0.75)	(0.09)	(0.00)	(0.16)	(0.45)
Political risk (t-1)	-0.00	0.01	-0.01	-0.01	0.00	0.02	-0.01	0.03
	(0.86)	(0.70)	(0.18)	(0.78)	(0.16)	(0.51)	(0.16)	(0.15)
Inflation (t-1)	0.01***	0.03***	0.00	0.03	0.01***	0.03***	0.00	0.03***
	(0.00)	(0.00)	(0.54)	(0.75)	(0.00)	(0.00)	(0.70)	(0.00)
IMF program dummy	-0.05	-0.09	-0.03	0.14	-0.02	-0.10	-0.03	0.20
	(0.61)	(0.61)	(0.43)	(0.62)	(0.17)	(0.50)	(0.46)	(0.30)
Growth of trading partners (t-1)	-0.00	-0.05	0.01	-0.02	0.00	-0.10	0.01	0.01
	(0.78)	(0.67)	(0.34)	(0.64)	(0.93)	(0.32)	(0.36)	(0.81)
Total debt/GDP (t-1)	-0.00	0.00	-0.00	0.00	-0.00	0.00	-0.00	0.01
	(0.65)	(0.50)	(0.48)	(0.81)	(0.80)	(0.64)	(0.35)	(0.33)
Constant			0.00	3.19			0.00	1.13
			(.)	(0.52)			(.)	(0.56)
AR(1) p-value	0.08	0.01	0.00	0.00	0.10	0.01	0.00	0.00
AR(2) p-value	0.42	0.30	0.10	0.30	0.11	0.27	0.10	0.27
Overindentification p-value	0.11	0.49	0.47	0.35	0.01	0.31	0.44	0.03
Number of observations	768.00	840.00	840.00	840.00	840.00	840.00	840.00	912.00
Number of insturments	28.00	29.00	31.00	31.00	31.00	29.00	31.00	32.00
Number of countries	72	72	72	72	72	72	72	72

1/Diference GMM regression instruments based on 2- l6 ags of tax revenue and private finance/dummy. System GMM insturments based on 2-5 lag differences of tax revenue and private finance. All regressions two step, roust and include a full set of year dummies. P-values based on robust standard errors in parenthesis; ***(**,*) indicate significance at 1 (5,10) percent.

IV. ADDRESSING HETEROGENEITY

Our previous findings revealed that market access has a positive effect on DRM. Next, we explore potential heterogeneities of this effect related to (i) countries' level of development, (ii) the type of market access, (iii) and the frequency of international bond issuances.

We begin by conditioning the effect of market access on countries' level of economic development within our sample of developing countries. We make the distinction between

low income countries (LICs) and middle-income countries (non-LICs), using the IMF classification. We then estimate the effect of market access on DRM for each group, using the entropy balancing methodology. The results reported in column [1] of Table 8 suggest that market access has a positive effect on DRM only in non-LICs. The estimated effect for LICs is not statistically different from zero.

We then make the distinction between countries with international bond market access and those that have contracted only external commercial debt. Our assumption is that international bond issuances could be the driving force behind the positive estimate, given that these issuances are more transparent and require in-deep assessments of issuers' capacity to repay, including in the bond prospectuses. They may also improve issuers' tax efforts due to the bond vigilante effect. The results in column [2] of Table 8 show a positive effect on DRM only for countries with access to international bond markets, confirming our theoretical insight that market forces (i.e., market discipline) are the drivers of the estimated positive effect of market access on DRM.

Third, building on our finding in column [2] of Table 8, we condition the effect of market access on DRM on the regularity of international bond issuances. Namely, we make the distinction between countries that have issued bonds more regularly (i.e. at least two-thirds of the sample years) and those that have not. The results in column [3] of Table 8 suggest that the positive effect on DMR is only apparent for the sample of countries that have issued bonds regularly. This may suggest that regular bond issuers factor in the need for building credibility with their potential bondholders on their capacity to repay, by increasing their DRM effort.

Fourth, we distinguish between commodity and non-commodity exporters market access countries and estimate the treatment effect for the two groups. The findings in column [4] of Table 8 suggest a positive effect for both groups. However, the magnitude of the estimate is larger for commodity exporters, suggesting that the market discipline effect may be more pronounced for that group.

Fifth, we condition the effect of market access on the occurrence of executive elections, as policymakers may adopt new taxes and change the rates of existing taxes while minimizing the political unattractiveness of tax finance (Alesina et al., 1997; Ebeke and Olcer, 2013). The results in column [5] of Table 8 suggest that market access has a positive effect on DRM only in non-election periods; the estimate for elections periods in not statistically different from zero.

Finally, we also use the panel regression country-specific specification to estimate the impact of the continuous measure of market access on Sub-Saharan African (SSA) countries given the recent increase in their access to market financing. The regression (Table 9) shows some significance in the relationship, particularly when controlling for external debt levels.

However, the results appear to be influenced by the small sample size and presence of outliers.[12]

[12] Out of a total sample size of 21, 11 out of 12 countries were occasional issuers. Significance would also be lost with the removal of Angola, which had relatively large tax revenue ratios (average 32 percent of GDP) compared with the rest of the regional sample (average 14.0 percent of GDP).

Table 8: Heterogeneity of the Effect of Market Access on DRM—Entropy Balancing.

	[1]	[2]	[3]	[4]	[5]
Market Access, LICs	0.182				
	(0.576)				
Market Access, non-LICs	1.603 ***				
	(0.415)				
External commercial debt		0.650			
		(0.435)			
International bond markets		3.890 ***			
		(0.502)			
Occasional bond issuers			-0.650		
			(0.435)		
Regular bond issuers			3.240 ***		
			(0.584)		
Market Access, commodity exporters				1.811 ***	
				(0.531)	
Market Access, non-commodity exporters				0.805 **	
				(0.395)	
Market Access in election periods					-0.229
					(0.786)
Market Access in non-election periods					1.075 ***
					(0.425)
Covariates in the second step	Yes	Yes	Yes	Yes	Yes
Year fixed effect in the second step	Yes	Yes	Yes	Yes	Yes
Regional fixed effect in the second step	Yes	Yes	Yes	Yes	Yes
R2	0.422	0.444	0.444	0.418	0.414
Observations	1,007	1,007	1,007	1,007	1,007

Notes: This Table presents the heterogeneity of the effect of market access on DRM obtained by weighted least squares regressions. Standard errors are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9. Fixed Effects Regression for Sub-Saharan African Countries Results[1]

Dep. Variable	(1) Tax rev (log)	(2) Tax Rev (level)	(3) Tax rev (log)	(4) Tax Rev (level)	(5) Tax rev (log)	(6) Tax Rev (level)	(7) Tax rev (log)	(8) Tax Rev (level)
Market access dummy (t-1)	-0.018	0.405	0.029	1.100				
	(0.69)	(0.51)	(0.49)	(0.23)				
Private finance/GDP (t-1)[2]					0.007	0.310*	0.018**	0.482***
					(0.46)	(0.07)	(0.04)	(0.01)
Grants/GDP (t-1)	0.005	0.016	-0.001	-0.018	0.005	0.014	-0.001	-0.019
	(0.26)	(0.62)	(0.58)	(0.46)	(0.28)	(0.68)	(0.55)	(0.42)
GDP per capita, log (t-1)	0.104	-0.550	-0.201	-3.295	0.107	-0.375	-0.184*	-2.826
	(0.58)	(0.78)	(0.10)	(0.17)	(0.56)	(0.83)	(0.09)	(0.13)
Trade openness, log (t-1)	0.641***	8.607***	0.471***	8.152**	0.637***	8.300***	0.447***	7.427**
	(0.00)	(0.00)	(0.01)	(0.04)	(0.00)	(0.00)	(0.00)	(0.03)
Agriculture/GDP (t-1)	-0.005	-0.082	0.003	-0.015	-0.005	-0.075	0.004*	-0.001
	(0.55)	(0.25)	(0.13)	(0.75)	(0.57)	(0.29)	(0.05)	(0.98)
Political risk (t-1)	0.013	0.108	0.002	0.041	0.013	0.105	0.001	0.035
	(0.17)	(0.32)	(0.75)	(0.71)	(0.17)	(0.32)	(0.79)	(0.75)
Inflation (t-1)	0.003	-0.001	-0.006**	-0.121**	0.003	-0.001	-0.006***	-0.120**
	(0.11)	(0.96)	(0.02)	(0.04)	(0.12)	(0.93)	(0.01)	(0.04)
IMF program dummy	0.005	0.191	0.005	0.165	0.009	0.304	0.011	0.320
	(0.82)	(0.59)	(0.81)	(0.71)	(0.69)	(0.44)	(0.62)	(0.51)
Growth of trading partners (t-1)	-0.003	0.072	0.002	0.090	-0.003	0.068	0.001	0.078
	(0.54)	(0.56)	(0.76)	(0.53)	(0.58)	(0.56)	(0.80)	(0.56)
Total debt/GDP (t-1)	-0.000	-0.007			-0.000	-0.007		
	(0.77)	(0.32)			(0.77)	(0.32)		
External debt/GDP (t-1)			-0.001***	-0.015***			-0.001***	-0.015***
			(0.00)	(0.01)			(0.00)	(0.01)
Domestic debt/GDP (t-1)			-0.002	-0.027			-0.002	-0.017
			(0.44)	(0.61)			(0.48)	(0.71)
Constant	-1.378	-22.083	2.119**	3.619	-1.409	-22.270	2.088**	3.059
	(0.48)	(0.22)	(0.03)	(0.83)	(0.47)	(0.21)	(0.03)	(0.84)
R2	0.396	0.363	0.519	0.356	0.396	0.376	0.531	0.377
Observations	369.000	369.000	286.000	286.000	369.000	369.000	286.000	286.000
Countries	27	27	21	21	27	27	21	21

1/Dependent variable is total tax revenue to GDP (logs and level). Regressions include country and year fixed effects. P-values based on robust standard errors in parenthesis; ***(**,*) indicate significance at 1 (5,10) percent.

V. CONCLUSION

We have used different methodologies to answer the empirical question of whether access to private financing (international bond markets and external commercial loans) affects low-income and emerging market economies' ability to collect domestic revenue. Our results suggest no evidence that access to bond markets or external commercial loans undermines the countries' efforts to collect tax revenue. On the contrary, we found that access to markets has a positive impact on domestic revenue mobilization. Plausible explanations are that private financing must be repaid, and strong macroeconomic fundamentals are key for maintaining market access. We have also found that macroeconomic stability and the strength of institutions do matter for domestic revenue mobilization. Our results do not suggest that access to private financing would be unequivocally conducive to higher domestic revenue mobilization. On the contrary, given mounting concerns over the sustainability of public debt in many countries, our paper contributes to the "wake-up call" for low-income and emerging market economies to continue enhancing tax administration and policy to increase domestic revenue mobilization. They also need to continue strengthening debt management practices for managing debt risks, including those related to market access and particularly exchange rate and interest rate risks.

Our results also serve as a starting point for several areas for further research. A deeper analysis of the impact of market access on the various subcomponents of tax revenue (e.g. income tax, trade taxes) could shed further light on the channels in which private external financing may impact revenue mobilization. A deeper look at the timing of market access and the time it takes for country to mobilize revenues may also be informative. Finally, consideration of the impact of the business cycle (e.g. through looking at cyclically adjusted revenues) could further test the relationship between private external financing and tax revenues.

References

- Alesina, A., Roubini, N., Cohen, G.D., 1997. Political cycles and the macroeconomy, MIT Press.

-Ardagna, S., Caselli, F., & Lane, T. (2007). Fiscal discipline and the cost of public debt service: Some estimates for OECD countries.

- Balima, W.H., Combes, J-L., Minea, A., 2016. Bond markets initiation and tax revenue mobilization in developing countries, *Southern Economic Journal*, 83, 2, 550–572.

- Balima, W.H., Combes, J-L., Minea, A., 2018. The 'dark side' of credit default swaps initiation: A close look at sovereign debt crises. *Macroeconomic Dynamics*, forthcoming.

- Balima, W.H., Sy, A. 2019. The impact of bailouts on the probability of sovereign debt crises: Evidence from IMF-supported programs, *IMF wp*, 19/ 2.

- Baunsgaard, T., Keen, M., 2010. Tax revenue and (or) trade liberalization, *Journal of Public Economics*, 94, 9–10, 563-77.

-Bayoumi, T., Goldstein, M., & Woglom, G. (1995). Do Credit markets discipline sovereign borrowers? Evidence from U. S. states. Journal of Money Credit, and Banking, 27, 1046–1059.

-Bulut, L. (2012). Market discipline of the developing countries' sovereign governments. Contemporary Economic Policy, 30, 463–488.

- Benedek, D., Crivelli, E., Gupta, S., Muthoora, P., 2014. Foreign Aid and Revenue: Still a Crowding-Out Effect? *FinanzArchiv / Public Finance Analysis*, 70, 1, 67–96.

- Benedek, D., Crivelli, E., Gupta, S., and Muthoora P., 2012. Foreign Aid and Revenue: Still a Crowding Out Effect? *IMF wp*, 12/186.

-Bishop, G., Damrau, D., Miller, M. (1989). 1992 and Beyond: Market discipline can work in the EC monetary Union. Salomon Brothers: London.

- Chen C., Dabla-Norris, E., Rappaport, J., and Aleksandra Zdzienicka, A., 2019. Political Costs of Tax-Based Consolidations. *IMF wp*, 19/298

- Clist, P., Morrissey, O., 2011. Aid and Tax Revenue: Signs of a Positive Effect Since the 1980s, *Journal of International Development*, 23, 165–180.

- Ebeke, C., Olcer, D., 2013. Fiscal Policy over the Election Cycle in Low-Income Countries, *IMF wp*, 13/153, 1–18.

- Fuchs, A., Dreher, A., Nunnenkamp, P., 2014. Determinants of Donor Generosity: A Survey of the Aid Budget Literature, *World Development*, 56, 172–99.

- Gaspar, V., L. Jaramillo, and P. Wingender, 2016. "Tax Capacity and Growth: Is there a Tipping Point?" IMF Working Paper, No. 16/234.

- Gelos, R.G., Sahay, R., Sandleris, G., 2011. Sovereign borrowing by developing countries: What determines market access? *Journal of International Economics*, 83, 2, 243–54.

- Ghura, D., 1998. Tax Revenue in Sub-Saharan Africa: Effects of Economic Policies and Corruption, *IMF wp*, 98/135, 1–25.

- Gupta, A.S. 2007. Determinants of tax revenue efforts in developing countries, *IMF wp*, 07/184, 1-39.

- Gupta, A.S., Clements, B., Pivovarsky, A., Tiongson, E., 2003. Foreign Aid and Revenue Response: Does the Composition of Aid Matter? *IMF wp*, 03/176, 1–22.

- Hainmueller, J., 2012. Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. *Political Analysis* 20, 25–46.

- IMF, 2010. Eligibility to Use the Fund's Facilities for Concessional Financing. *IMF policy paper.*

-Lane, T. (1993). Market discipline. IMF Staff Papers, 40, March, 53-88.
Lledo, V. and Poplawski-Ribeiro M., 2013. Fiscal Policy Implementation in Sub-Saharan Africa. World Development Vol.46, pp 79-91, 2013.

- McGillivray, M., Morrissey, O., 2004. Fiscal effects of aid. In Fiscal Policy for Development, Addison T, Roe A (eds). Palgrave/WIDER: Basingstoke, 72–96.

- Neuenkirch, M., Neumeier, F., 2016. The impact of US sanctions on poverty. *Journal of Development Economics* 121, 110–119.

- Uribe, M., Yue, V.Z., 2006. Country spreads and emerging countries: Who drives whom? *Journal of International Economics*, 69, 1, 6–36.

Annex

Table A1. Countries by Issuer Group	
Issuer Group	**Countries**
Non-issuer	Algeria, Bangladesh, Botswana, Burkina Faso, The Gambia, Guinea, Guinea-Bissau, Guyana, Haiti, Iran, Liberia, Madagascar, Malawi, Mali, Moldova, Myanmar, Nicaragua, Niger, Sierra Leone, Sudan, Tanzania, Togo, Uganda, Yemen, Zimbabwe
Occasional Issuer (issued 1-9 years in sample period)	Albania*, Angola*, Armenia*, Azerbaijan*, Belarus*, Bolivia*, Bulgaria, Cameroon*, Costa Rica, Cote d'Ivoire*, Dominican Republic, Ecuador*, Egypt, El Salvador, Ethiopia*, Gabon*, Ghana*, Guatemala, Honduras*, Jordan*, Kazakhstan, Kenya*, Morocco, Mozambique*, Nigeria*, Pakistan*, Papua New Guinea*, Paraguay*, Senegal*, Vietnam*, Zambia*
Regular Issuer (issued >9 years in sample period)	Brazil, China, Colombia, India, Indonesia, Jamaica, Mexico, Peru, Philippines, Romania, Russia, South Africa,Thailand, Tunisia*, Turkey, Ukraine
*Indicates country had debut bond market issuance during 2004–18	

Table A2. Balima et al. (2016)'s benchmark result of bond markets participation on domestic tax revenue.									
Dependent variable:	N Nearest Neighbor Matching			Radius Matching			Kernel	Local linear	Stratification
Tax revenue ratio	N=1	N=2	N=3	r=0.005	r=0.01	r=0.05	Matching	Matching	Matching
Baseline result									
[0] **ATT**	**1.225****	**1.473*****	**1.565*****	**1.565*****	**1.669*****	**1.758*****	**1.769*****	**1.727*****	**1.555*****
	(0.614)	(0.584)	(0.544)	(0.514)	(0.496)	(0.443)	(0.476)	(0.467)	(0.479)
Treated/Untreated/Total observations	511/1300/1811	511/1300/1811	511/1300/1811	465/1300/1765	505/1300/1805	511/1300/1811	511/1300/1811	511/1300/1811	587/1160/1747
Bootstrapped standard errors are in parenthesis. There are based on 500 replications. ***. **. * respectively represent significance thresholds of 1%. 5% et 10%									