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Institutional quality, economic development and the performance of VAT[1]

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Content

List of acronyms

Abbreviation	Explanation
AEO	African Economic Outlook
BeFinD	Belgian Policy Research Group on Financing for Development
CEPALSTAT	Comisión Económica para América Latina y el Caribe (United Nations Economic Commission for Latin America and the Caribbean) database
DRM	Domestic Resource Mobilization
EU	European Union
GDP	Gross Domestic Product
GFS	IMF Government Finance Statistics
ICTD	International Centre for Tax and Development
IMF	International Monetary Fund
IMF WoRLD	IMF World Revenue Longitudinal Data
OECD	Organisation for Economic Co-operation and Development
PRS	Political Risk Services International Country Risk Guide database
RMCD	Royal Malaysian Customs Department
SSA	Sub-Saharan Africa
SYS-GMM	System- Generalized Method of Moments
VAT	Value Added Tax
WB	World Bank
WDI	World Development Indicators Data
WGI	Worldwide Governance Indicators (World Bank)

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Abstract

In this paper we test, empirically, to which extend the Value- Added Tax (VAT) is a relevant-policy option for developing countries aiming to improve upon their domestic resources mobilization (DRM). First, we investigate the contribution of VAT to tax collection across developed and developing countries. We also provide a comparative analysis between Sub-Saharan Africa (SSA) and other developing countries. Second, we examine the role of institutional quality in enhancing domestic-tax mobilization in the presence of VAT adoption. For these purposes, we employ a panel data model that takes into account the standard determinants of the tax-effort function as well as the institutional and geographical characteristics of countries. Analysis of data from 149 countries over the 1970 - 2013 period indicates that VAT adoption improved tax-revenue collection in both developed and developing (SSA and non SSA) countries. Moreover, the marginal effect of VAT adoption is estimated to be strong for SSA and other developing countries as compared to their developed counterparts. The positive effect of VAT on tax collection in SSA is reassuring because some earlier studies were not able to identify an overall positive effect for the region. We show that analysis of data over the recent period is important to find a positive effect for SSA. As regards the role of institutional quality, we find that, tax-revenue collection is higher in countries with a better-institutional quality - even before VAT adoption. Interestingly, we show that the gain from adopting VAT is maximized in such countries. Given VAT is by now adopted in almost all countries across the world, our findings suggest the need to promote reforms to improve the quality of institutions that facilitate tax collection in developing countries.

JEL Classification: Value-Added Tax (VAT), Domestic Resources Mobilization (DRM), Tax Reform, Institutional Quality, Economic development
Keywords: H20, H21, H25, H26, O17, O11

0 | Introduction

Developing countries are increasingly encouraged to improve their tax revenue mobilization in order to close their huge-financing gap (Ahlerup et al., 2015; UNECA, 2016). Since the 2002 'International Conference on Financing for Development' (in Monterrey, Mexico)[2] the international community has stressed that developing countries need to work on domestic resource mobilization (DRM) in order to make their growth objectives attainable and sustainable. Follow ups of this conference in 2008 (in Doha, Qatar) and 2015 (in Addis Ababa, Ethiopia) have only strengthened the agreement on this objective - both among developing countries and donor-partner countries.

One good-candidate tax instrument that is instrumental for DRM is the Value-Added Tax (VAT). First, VAT is relatively easier to administer and as a result it is less susceptible to tax evasion. Indeed, since VAT implies a trail of invoices and also the fact that it is charged, based on the value-added, through the production chain, it facilitates the detection of non-compliances. In this sense, VAT is argued to be 'self-policing' (Bird and Gendron, 2007 Le, 2003; and Lin, 2008). Second, in the specific context of developing countries, VAT is in principle relatively less sensitive to the informal market and, if well designed, it can even be used as a tool to reduce the size of the informal sector (Boadway and Sato, 2009). Third, VAT is also potentially one of the less distortionary taxes (Kneller et al., 1999. For instance, in comparison with income taxes VAT does not distort consumption decisions relative to savings and investment decisions (e.g. Le, 2003). In the same way, in comparison with other consumption taxes VAT does not entail cascading effects (i.e. taxes on a commodity is levied at each stage of the production chain without deductions) since sellers (i.e. firms paying VAT) can claim credit for the VAT paid up on their intermediate inputs.

As such, existing literature shows that VAT adoption tends in general to positively impact on government revenue (e.g. McGowan and Billings, 1997; Keen, 2008; Keen and Lockwood, 2006 and 2010; Martinez-Vazquez and Bird, 2011; Ahlerup et al., 2015). This revenue enhancing impact of VAT adoption is known as the money-machine hypothesis (Keen and Lockwood, 2006 and 2010, Ebrill et al., 2001).3 Especially, Keen and Lockwood (2006) find evidences in support for the money machine hypothesis for 30 OECD countries using data over the period 1965–2004. In a related study Keen and Lockwood (2010) analyze data on a broader sample of 142 countries in 1975-2000. Their findings confirm the positive effect of VAT on tax collection in a wide range of countries across different parts of the world but not in Sub-Saharan Africa (SSA). In particular, they predicted an average-negative impact of VAT in SSA countries that have not yet adopted it by 2000 (14 countries with negative effects versus 11 countries with positive effects). In the same way, Ahlerup et al. (2015) argue that VAT has no effect on tax revenue in SSA (1980-2010).

In this paper we revisit the money-machine hypothesis with the objective to test empirically, to which extent the Value- Added Tax (VAT) adoption is a relevant option for developing countries aiming to close their huge financing gap. First, we investigate the contribution of VAT to tax revenue across three groups of countries: advanced, Sub-Saharan Africa (SSA), and other developing countries. Second, we examine the

2 The 'Monterrey Consensus', a key agreement on international cooperation relating to development financing, states the following six areas of focus: namely i) mobilizing domestic financial resources for development ii) mobilizing international resources for development (FDI and other private flows) iii) focusing on international trade as an engine for development iv) increasing international financial and technical cooperation for development v) managing external debt vi) addressing systemic issues (enhancing the coherence and consistency of the international monetary, financial and trading systems in support of development), UN (2003).

3 Yet, the aforementioned efficiency appeals of VAT is also seen as a fundamental flaw by some political groups. VAT tax is seen by its critics as 'too easy a way of collecting revenue' (Hooper and Smith, 1997; McGowan and Billings, 1997; Keen and Lockwood, 2006).3 This explains why some countries (such as the US) are yet to adopt the tax system. Other scholars (e.g. Brennan and Buchanan, 1977) even go to the extent of arguing that giving efficient tax instruments such as VAT to 'self-interested' governments might lead to reduced public wellbeing.3 Further, Martinez-Vazquez and Bird (2011) argue that even if there could be an evidence for VAT to present significant revenue gains, it would still be difficult to accord all the revenue gains simply to the adoption of VAT. They note that most countries that adopted VAT actually undertook various changes in their administrative apparatus and tax policy. However, in whichever way we may look at it, the adoption of VAT itself or the accompanying policy changes will make countries potential beneficiaries from this tax innovation. It is especially apparent to assume that developing countries that have a rather unfavourable tax policies and administrative systems could stand to benefit from i) the efficiency gains associated with VAT and ii) reforms they might undertake to make the VAT work -- which ultimately ends up being beneficial.

role of institutional quality in enhancing domestic tax mobilization in the presence of VAT adoption. For these purposes we employ a panel data model that takes into account geographical characteristics as well as other standard determinants of the tax-effort function. Especially, we include a spatial lag term to control for regional determinants of tax effort. Analysis of data from 149 countries in 1970 - 2013 indicates that VAT adoption improves tax-revenue collection in SSA as well as in the two other groups. The positive effect of VAT on tax collection in SSA is reassuring because earlier studies were not able to establish an overall positive effect in the region. We show that data over the post-2000 period (which saw the adoption of VAT by more than 20 SSA countries that introduced reforms allowing to shift from trade taxes to goods and service taxes) is critical to find a positive and significant effect of VAT on tax collection in SSA. Sections 4.2 and 4.3 below detail on this issue.

As regards the role of institutional quality we find that, unrelated to VAT adoption, tax-revenue collection is higher for countries with a better-institutional quality. Overall, we show that the gain from VAT adoption is maximized in countries that display a better-institutional quality. Given VAT is by now adopted in almost all countries across the world, our findings thus suggest the need to support reforms to improve the quality of institutions that facilitate tax collection of developing countries.

This paper contributes to the debate about strategies to improve DRM in developing countries. First, we test the money-machine hypothesis using data that includes the more recent period over which VAT has been adopted in many developing countries (see Figure 10 and Table A2 in Annex). We show that data of the post-2000 period is particularly interesting to revisit the impact of VAT in SSA. Moreover, we explicitly compare the marginal effect of VAT across countries at different stages of economic development (developing versus advanced countries). Second, we integrate into the analysis of the money-machine hypothesis the role of institutional quality in enhancing VAT revenue collection. The results of the later objective carry important policy implications. For instance, countries that have adopted VAT (but witness less than optimal revenue streams) could potentially improve the revenue contribution of their VAT system by improving broad institutional infrastructure.

A good-institutional environment should improve both the demand as well as the supply factors inherent to the performance of VAT. In particular, existing research has documented the role of institutional factors (such as the capacity of the tax administration, government effectiveness in providing public goods, trust in the government, culture and regulatory issues etc.) on the effectiveness of tax policies and tax compliance (e.g. Araujo and Arvate, 2016, Bird et al 2006 and 2008; Barbone at al., 2012, Cnossen, 2015, Kaldor, 1963; McGowan and Billings, 1997; Tanzi, 2004; Bird and Zolt, 2005; Moore, 2014, Sancak et al., 2010). For instance, the cross-country analysis presented by Bird et al. (2008) points to a positive role of intitutions such as control of corruption, voice, and accountability on tax effort in both developed and developing countries. In a related study, Ahlerup et al. (2015), show the vital role played by institutional reforms such as the establishment of autonomous-revenue authorities in SSA, along with tax policy reforms in the region, in boosting tax revenue.4

The remainder of the paper is structured as follows. Section 2 presents the methodology. We present the empirical model and subsequently the data used and some descriptive statistics. Section 3 discusses the results and last section concludes.

4 In the same way, the empirical review presented by Barbone at al. (2012) indicates that the compliance to VAT is high in EU countries that display a better-institutional quality.

1 | Methodology

1.1 Modelling tax revenue

It is common place in the literature to study the impacts of tax instruments on revenue collection using the 'tax effort' equation. The 'tax effort' equation allows to estimate the actual level of tax revenue collected in relative terms to what countries are normally expected to collect, given the structure and size of their economy (e.g. Moore, 2014; Cnossen, 2015; Dioda, 2012; Gupta, 2007; Keen and Lockwood, 2010).

We employ the following empirical model for the tax effort:

$$Tax_{i,t} = \alpha + \beta VAT_{i,t} + \gamma X_{i,t} + \delta \sum_{j=1}^{n} w_{ij} Tax_{j,t} + \varepsilon_{i,t}, i = 1, \ldots, n\,, \qquad (1)$$

Where,

- Tax_{it} represents the level of tax revenue to GDP ratio for country 'i' in year 't';
- $VAT_{i,t}$ is our regressor of interest. It represents the policy dummy (=1 if VAT is in place) signifying VAT adoption for country 'i' in year 't';
- X_{it} represents all other explanatory variables included in the typical tax effort equation including: the level of development (measured by per capita GDP), size of the informal sector (captured by agriculture's share of GDP), country size (captured by size of total population), size of dependent population (captured separately by the share of 'young' - less than 15 years - and 'old' - 65 plus years - population segment), and institutional quality (captured by six specific indices measuring various dimensions of governance quality). For the full list of variables in the analysis, see Table A1 in the Annex.
- ε_{it} represents the random error term.
- The term $\sum_{j=1}^{n} w_{ij} Tax_{j,t}$ represents the tax effort in neighbor countries, measured as a weighted average of tax collection of these countries where the w_{ij} denote the physical distance between country 'i' and others. These weights represent entries of the well-known spatial weighting matrix (see Anselin 1988; Cliff and Ord 1981; LeSage and Pace 2009). As such, the (δ) parameter in Eq. 1 is known as the spatial autocorrelation on tax revenue. It tells us whether the level of taxation in country 'i' could be significantly explained by the level of taxation of countries that are located nearby. The importance of including spatial determinants in our analysis also bases itself on the theoretical and empirical evidence where countries adopt VAT after observing its successful implementation amongst other countries (Ebrill et al., 2001; Bird and Gendron, 2007; Pomeranz, 2015), especially in neighbouring countries (Keen and Lockwood, 2010)

1.2 Data used

1.2.1 Basic data

We use an unbalanced data from 149 developing and developed countries over the 1990-2013 period. See Annex 2 for the complete list of countries included in the analysis. The list of variables used, their description, data source and basic statistics is also given Table A1 in the annex. Our main dependent variable (tax revenue to GDP) comes from IMF World Revenue Longitudinal Dataset (WoRLD) database.

However, for robustness we also use a more comprehensive tax database compiled from different sources and that spans the 1970-2014 period (see Table 3, where robustness tests are conducted using this data).[5]

Our explanatory variables such as per capita GDP, agriculture's share of GDP, size of total population, young (<15 years of age) and old (≥65 years of age) segment of the demography as a share of total population, IMF repurchases (to proxy the link with international financial institutions) come from the World Bank's World Development Indicators (WDI). Openness is measured by the sum of exports and imports normalized by GDP. Data to estimate opens coms from the same source. Further, the VAT adoption years (that are used to mark the pre and post VAT periods) for countries are taken from Ernst and Young (2015) and RMCD (2016).

1.2.2 Measurement of institutional quality

We employ the Political Risk Services (PRS) database to measure institutional quality. Specifically, we use the aggregate and individual governance indicators of the PRS (for six dimensions of governance) made publicly available by 'The Worldwide Governance Indicators (WGI)' project of the World Bank. The data is available for 215 economies over the 1996–2014 period.[6] This dataset is widely used in a broad range of economics literature to capture the evolution of quality of institutions overtime and also to make comparisons among countries (Kauffman and Kraay, 2002; Dollar and Kraay, 2003; Rodrik et al., 2004; Wang, 2013).

The aggregate institutional index that we use is composed of six specific institutional indices. Specifically, it is taken as the average of 'voice and accountability', 'political stability', 'government effectiveness', 'regulatory quality', 'rule of law', and 'control of corruption'. For more on the definition, characteristics and statistical summaries of these indicators for our country panel, see Table A1 in Annex.

All indices are scaled on the range of 0 to 1, and the higher the score the better the quality of institutions in a country is. Generally we classify countries scoring below the 0.5 as having 'weaker' institutions and those scoring above 0.5 as having 'stronger' institutions. Looking at the distribution of institutional indices for the whole sample in Figure 1, we see, on average, that countries tend to score much lower on the 'control of corruption' and the 'government effectiveness' indices (see Table A1 in Annex).

The left half of Figure 2 displays the distribution of institutional quality scores for developed countries, while the right half displays the same information for developing countries. Figure 2 shows some visible differences across the two groups of countries. For instance, the mean score for developed countries is above the threshold score of 0.5 (on the scale of 0 to1), for all institutional indices. For developing countries, however, the scores of 'control of corruption' and 'government effectiveness' are below the threshold score. Looking at the realities of developing countries and the vast related literature (e.g. Mauro, 1995; Drury et al., 2006; Aidt et al., 2008), it is easy to understand why most of them receive lower scores on these indices. Most developing countries do suffer heavily from corruption and lack of effective government administration. This reduces the effectiveness of their tax systems.

5 This tax revenue database mainly combines IMF World Revenue Longitudinal Dataset (WoRLD) with the ICTD Government Revenue Database. The latter database is again an amalgam of diverse sources such as the African Economic Outlook (AEO); United Nations Economic Commission for Latin America and the Caribbean database (CEPALSTAT); IMF Government Finance Statistics (GFS); IMF Country Reports; 'World Tax Database' of Michigan Ross School of Business; OECD Tax Statistics; and Keen and Mansour (2010) tax data for African countries (see Prichard et al., 2014).

6 For more on this institutional data, visit the World Bank's website http://info.worldbank.org/governance/wgi/#home

Figure 1: Indices of institutional quality (all countries)

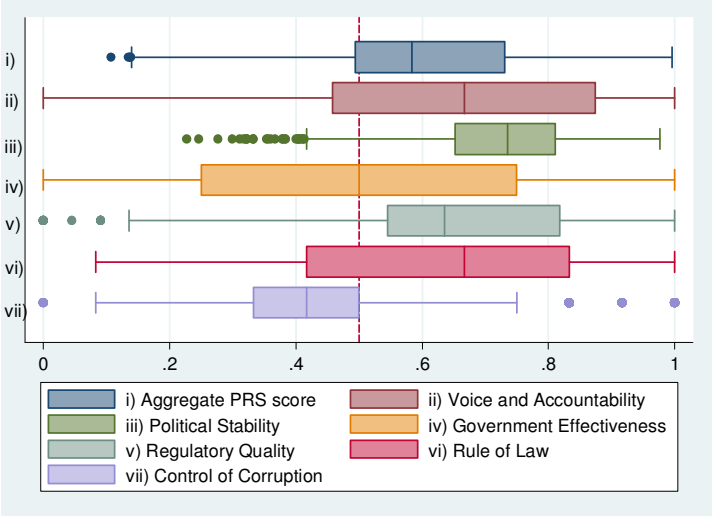
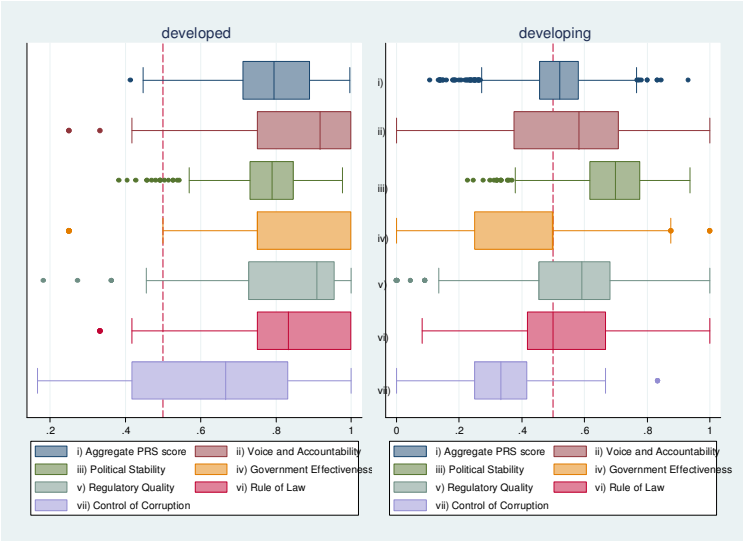


Figure 2: Indices of institutional quality (developed vs developing countries)



While almost all developed countries receive an overall institutional quality score that is deemed 'good' (i.e. upper half), only a little over half of developing countries receive a score that is in the same category (see box *plot-i* in Figure 2). For instance, there seems to be a big visible gap two groups on the basis of 'government effectiveness'. In developed countries, almost all countries receive a score above the threshold score of 0.5. In developing countries, however, about three quarters of them receive a score less than the threshold score. Further, developing countries also do worse on the measures of 'voice and accountability' and 'rule of law', compared to developed countries, although the gap on these indices is less pronounced than the gap on 'government effectiveness'. Interestingly, the one institutional dimension where both developed and developing countries do much worse is the 'control for corruption'.[7] For instance, looking at the six institutional indicators in Figure 2, almost all developed countries score in the upper half of the score range for all indices except for the measure of 'control for corruption'. Specifically, a little over a quarter of the developed countries still receive an institutional quality score for corruption in the lower 50% (i.e. a score below 0.5 in the 0-1 scale). The economic literature also confirms that many developed countries

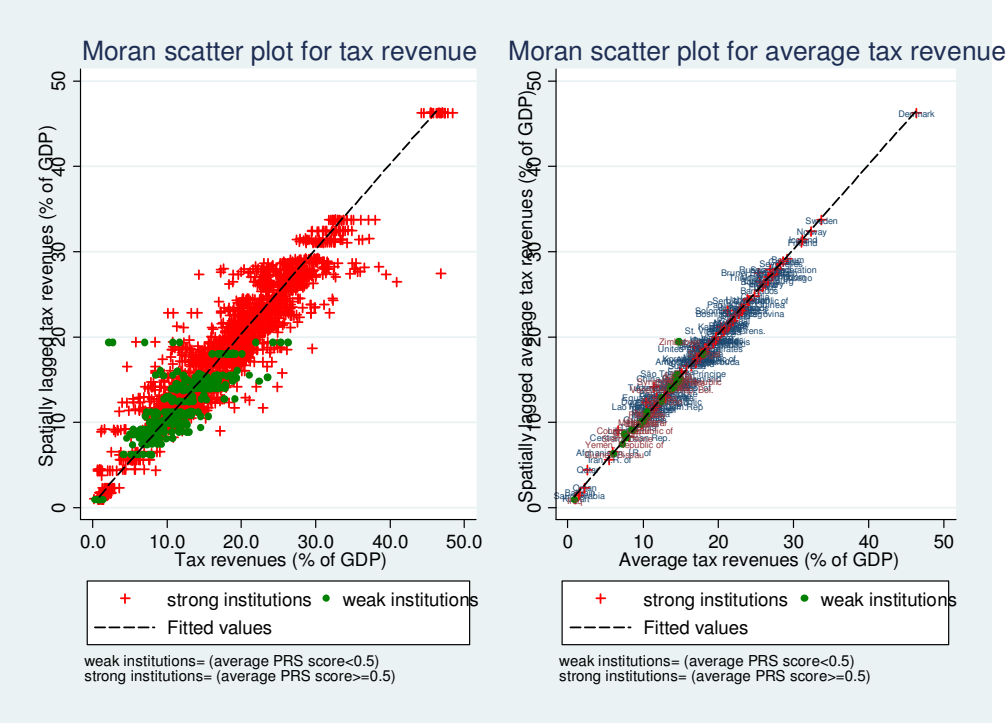
7 This explains why the institutional scores for 'control for corruption' appear to be very low in the in Figure 1.

still suffer from some degree of corruption problem (e.g. Bosco, 2016; Salinas-Jimenez and Salinas-Jimenez, 2007), although this is an even much bigger and deep rooted problem in developing countries.

1.3 Spatial issues in modelling tax revenue

The figure below is Moran's scatter plot. This scatter plot is essentially a 'univariate' plot that combines our dependent variable (tax revenue as a ratio of GDP) on the horizontal axis and the spatial lag of the dependent variable on the vertical axis. The slope of the fitted line represents Moran's I. The fact that the fitted line is positively slopped and very close to 1 (Moran's I is 0.891 for the whole sample) shows that there is a very strong spatial correlation among countries on the basis of their tax revenues. In other words, countries that are spatially clustered (i.e. geographically close to each other) together also tend to share comparable levels of tax revenues.[8]

Figure 3: Moran scatter plots for tax revenue

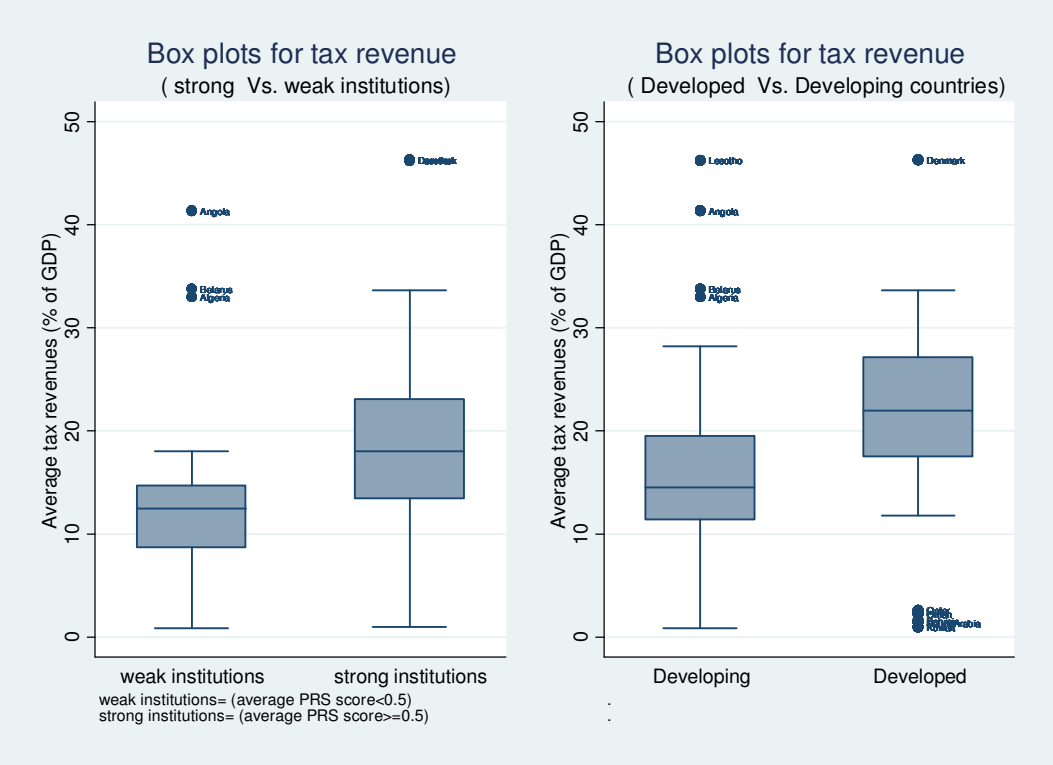


8 For a literature on spatial analysis and the Moran's I index see Kondo (2015); Drukker et al. (2013); Bai et al. (2012); Blanco (2012); Keller and Shiue (2007); Getis (2007); and Moran, (1950).

2 | Empirical results

Developed economies or countries that have better institutions on average derive a higher level of tax revenue, when compared to developing economies or countries with weaker institutions. This is clearly shown in the figure below. Figure 4 compares tax revenue across two dimension: the quality of institution; and the level of development. The left panel of the figure compares the distribution of tax revenues across country quartiles of 'weak' and 'strong' institutions using boxplots. Countries with 'weak' institutions are those scoring on average below 0.5 on the 0-1 scale. Those scoring above 0.5 are classified as having relatively 'strong' institutions. The right panels gives the same information; but this time by comparing 'developed' (i.e. high-income) economies with 'developing' ones. The average tax revenue in the group of good institutions, is about 18.4% of GDP while in the group with weaker institutions the same indicator is only 13.7%. Similarly, the average developed country has a tax revenue over 21% of GDP while it was just under 16% for its developing counterpart. These simple statistics reveal that tax revenues are obviously higher in countries that are richer and display stronger institutional quality.

Figure 4: Average tax revenue across country groups



(Based on institutional quality & economic development)

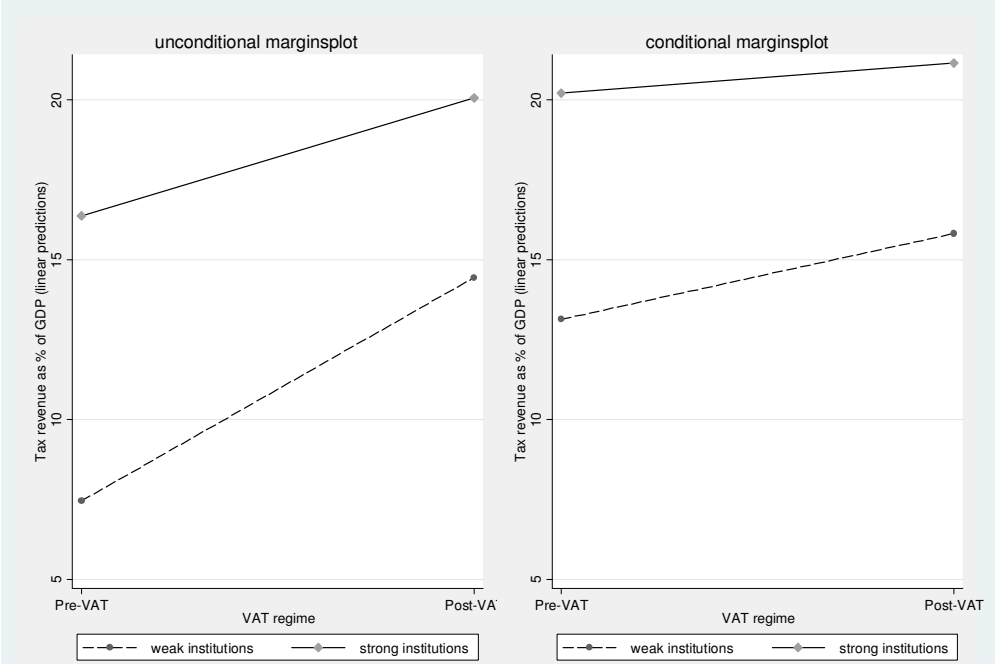
2.1 Marginal effects of VAT adoption

Figures 5 and 6 show the marginal effects of VAT adoption on tax revenue, interacting with the quality of institutions and the level of development, respectively. Since the 'VAT adoption' variable is a dummy that captures the state of VAT regime (i.e. pre-VAT vs post-VAT regime), we will have two states for the horizontal axis. The level of the tax revenue, on the other hand, is a continuous variable. In both figures, the panels on the left hand side show the unconditional margins plot (i.e. a simple tax revenue across VAT regimes is estimated without controlling on any determinants of the tax effort) while the ones on the right

hand side show the conditional margins plot (i.e. where the level of tax is estimated across VAT regimes but at the same time we control for the main determinants of the tax effort presented in Eq. 1 above).

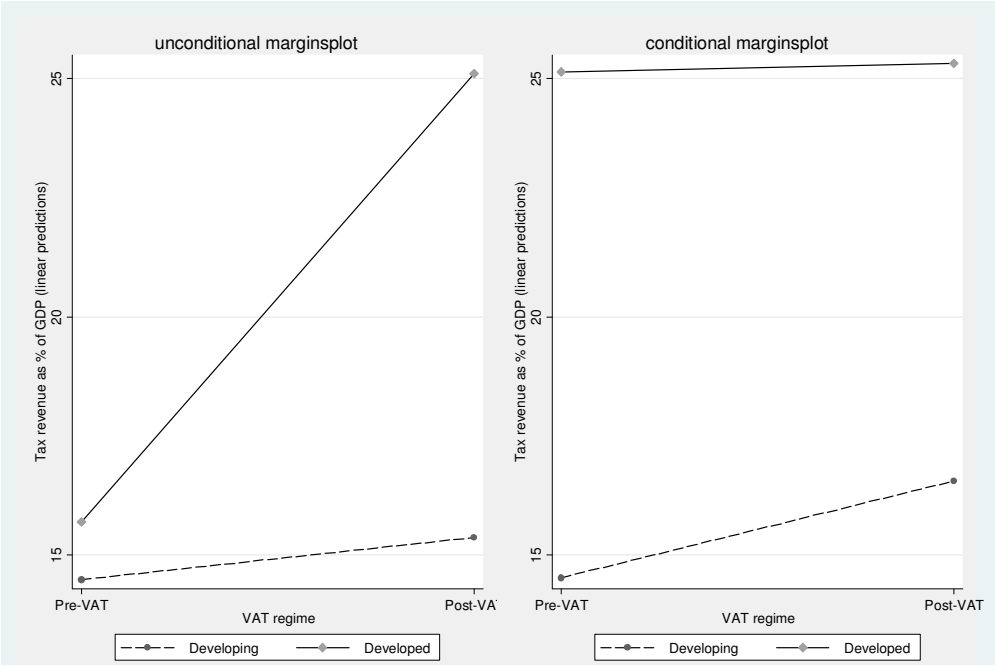
The lines under conditional margins plot are flatter than those under the unconditional margins plots. However, this is to be expected. The conditional marginal effects of the VAT adoption measures the impacts of VAT adoption while also specifically accounting for the impacts of other explanatory variables. Put another way, the unconditional marginal effects of VAT adoption appear to be very high since we are supposing (via specification) that all the changes in VAT revenue between the two VAT regimes are solely explained in terms of VAT adoption. Although that is a useful and simplistic summary, it does not enable us to measure the specific effects of VAT adoption in the realistic setting where other factors are also likely to affect the level of tax revenue.

Figure 5: Marginal effects of VAT adoption on tax revenue ('weak' vs 'strong' institution)



Note: Weak Institutions = (average PRS score <0.5); Strong Institutions = (average PRS score >=0.5)

Figure 6: Marginal effects of VAT adoption on tax revenue (developed vs developing)



Note: Developing = (low and middle income countries); Developed = (high income countries)

From the two figures we can draw these important conclusions:

- Countries with better institutions (or developed countries) derive a higher tax revenue than countries with weaker institutions (or developing ones).[9] This can be easily seen from the fact that the solid lines in Figures 5 and 6 are always above the broken lines.
- All the lines are positively slopped (although the degree of the slopes differs for individual cases). This implies that the adoption of VAT has been positive and it has yielded significant gains in tax revenue.

2.2 The Curious case of Sub-Saharan Africa (SSA)

Previous studies have not been able to identify a clear positive impact of VAT on tax collection in SSA (e.g. Keen and Lockwood, 2010 and Ahlerup et al., 2015). For instance, Keen and Lockwood (2010) analyse data from a broader sample of 142 countries in 1975-2000 and report a positive effect of VAT on tax collection in a wide range of countries across different parts of the world but not in Sub-Saharan Africa (SSA). In particular, they predicted an average-negative impact of VAT in SSA countries that have not yet adopted it by 2000 (14 countries with negative effects versus 11 countries with positive effects). One reason behind the SSA result may be related to the time span of their dataset. In order to get a better insight on this issue we provide a sub-period analysis around the year 2000.

To begin with Figure 7 reports the results for the whole time span i.e. 1970-2013. The results are essentially in lines with the ones we reported above for developed and developing countries. In particular, the right panel of Figure 8 shows that VAT has a positive and statistically-significant effect on tax revenue in SSA as well as in other developing countries. Things change dramatically when we perform a sub-period analysis around the year 2000. Figures 6c and 6d display results using data in 1970-2000 and 2001-2013, respectively.

9 As we can see from Figure 5, in countries with low institutional quality (without accounting for other explanatory variables) the introduction of VAT raised the tax revenue from about 7.45 % to 14.44% of GDP. Conversely, in countries with high institutional quality the tax revenue rose from 16.37% to 20%.

Figure 7: Marginal effects of VAT adoption: 1970-2013 (SSA vs. other developing countries)

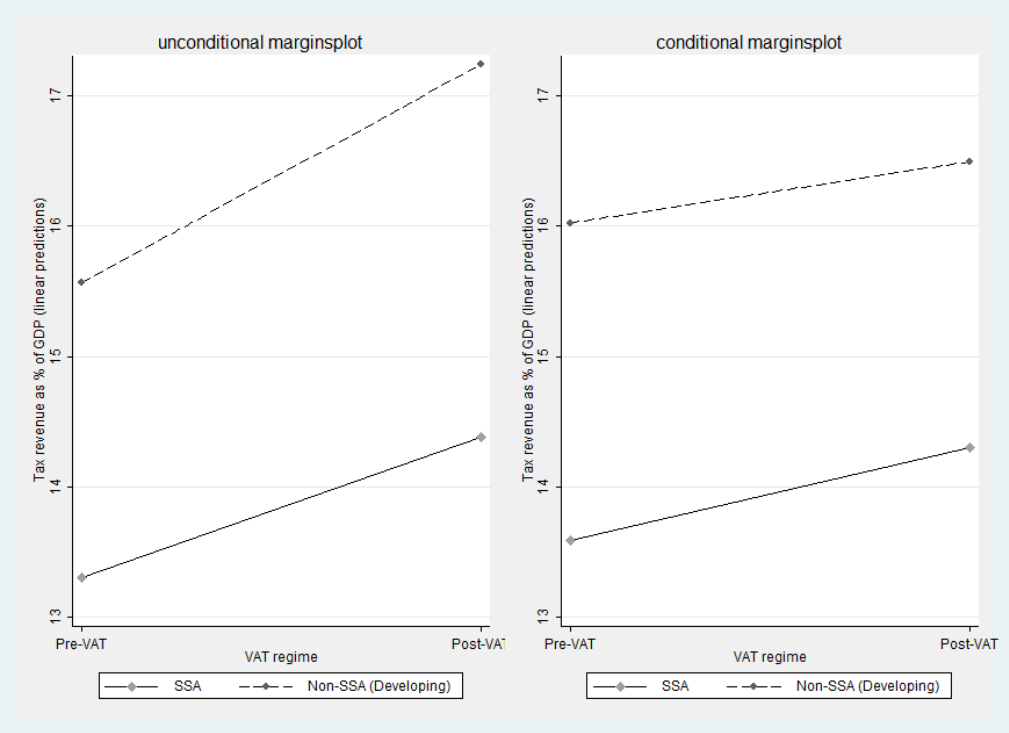


Figure 8: Marginal effects of VAT adoption: 1970-2000 (SSA vs. other developing countries)

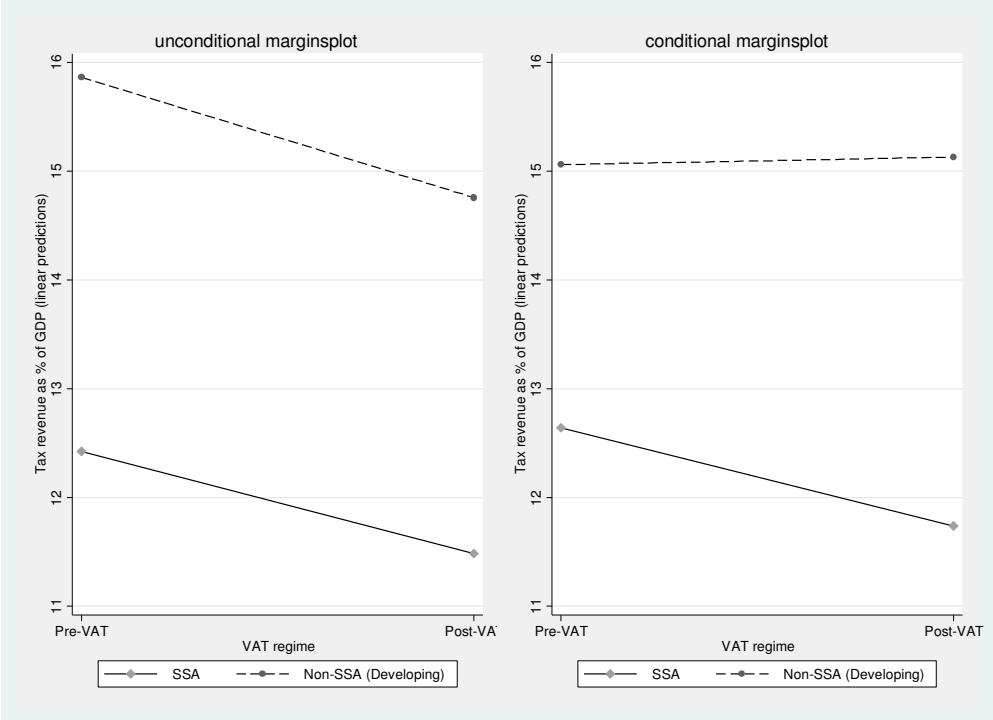
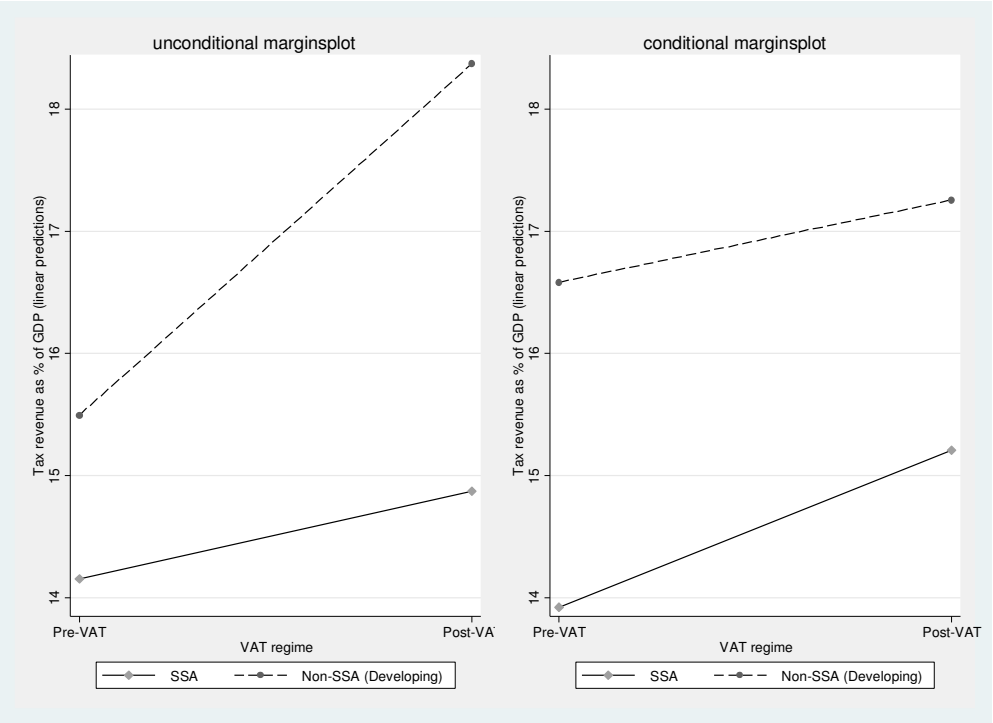


Figure 9: Marginal effects of VAT adoption: 2001-2013, (SSA vs. other developing countries)



Simply looking at the raw pictures of how tax revenues performed in the periods before and after the adoption of VAT across the sub-periods we see results that might explain the "tentative" reductions in tax revenue following VAT adoption in Sub-Saharan Africa. In particular, the data in the left panel of Figure 8 showing the unconditional marginal effect of VAT in 1970-2000 goes in line with the findings of Keen and Lockwood (2010). In fact, we see that other developing countries also appear to have seen a modest decline in revenue. However, this negative effect vanishes in non-SSA countries (but persists in SSA) after we account for other determinants of tax effort as reported in the right panel of Figure 8. , i.e. conditional marginal effect of VAT. Further, non-SSA developing countries, display a higher tax effort than SSA and as a result this negative effect of VAT in 1970-2000 would imply a divergence of SSA.

Things change dramatically when we now analyse the result over the 2001-2013 sub-period. The data reported in Figure 9 indicate that VAT adoption has a positive and significant effect in both SSA and other developing countries. The marginal effect is even slightly higher for SSA but the difference is not statically significant. A number of reasons could explain this change in dynamics of VAT effect across the sub-periods for SSA. For instance, VAT adoption could have a 'short term' reduction in tax revenue if the immediate revenues from VAT at its adoption does not compensate the proceeds of established tax instruments that the VAT is intended to replace (e.g. trade taxes that were common in the past in the region). However, in medium and long terms the capacity of the tax authorities develop (e.g. electronic scanners, cash register machines, efficient revenue collection bureaucracy, etc.), then the revenue collection from VAT starts to improve significantly in many countries. Indeed, the literature has shown that it take years for countries to improve the efficiency of their VAT system (e.g. Ebrill et al., 2001; Aizenman and Jinjarak, 2005; Keen, 2013; Houssa et al., 2016).

In a recent analysis Prichard et al., (2014) report that the gains in revenue mobilization in years have been most rapid in low-income countries, especially in Africa. The increased revenue from VAT and other sales taxes have been deriving a significant part of the overall rise in tax revenue across the developing world. In fact, trade liberalization was a requirement in important structural reform programs and also in accession to the World Trade Organization and other regional trade blocks. For instance, the ICTD database shows that trade taxes have declined by more than 25% since 1990 - while taxes on goods and services (primarily

constituted by VAT in developing countries) have increased by more than 80%. The growth in revenue attributed to these categories of tax (such as VAT) far outweighs the growth in revenue from any other sources, Prichard et al. (2014).

2.3 Regressions-estimating marginal effects of VAT (developed, developing and SSA)

To explicitly identify the marginal effects of VAT adoption, conditioned upon the effects of other explanatory variables, we estimate the following two-step SYS-GMM estimations. Column (1) delivers the estimation procedure that lies behind Figure 5 (i.e. comparing gains from VAT across countries with 'strong' and 'weak' institutional set-up). It reports the coefficients and significance of the standard explanatory variables of the tax revenue function along with our variables of interest, i.e. the VAT adoption dummy which is interacted with institutional capacity. Column (2), on the other hand, delivers the same analysis, except that it is based on comparing developed countries with developing countries (as in Figure 6). Column (3) compares SSA and non-SSA developing countries using all available time periods while column (4) analyses only the period up to 2000 and column (5) analyses the post 2000 time period. The exercises in column (4) and column (5) relate to the conditional margins plots depicted in Figure 8 and Figure 9 and are intended to address the intriguing results from earlier studies regarding VAT's dismal performance in SSA countries.

Table 1: Conditional marginal effects of VAT adoption, institutions & development

	'Strong' vs 'Weak' institutions	Developed vs Developing	SSA vs Non-SSA Developing (all years)	SSA vs Non-SSA Developing (pre 2000)	SSA vs Non-SSA Developing (post 2000)
	(1)	(2)	(3)	(4)	(5)
Ln(Per capita GDP)	0.265***	0.241***	-0.015	0.086	-0.066
	(0.03)	(0.02)	(0.055)	(0.141)	(0.109)
Openness	0.159***	0.218***	0.290***	0.614***	-0.454***
	(0.03)	(0.02)	(0.072)	(0.125)	(0.119)
Agriculture (share of GDP)	0.046	0.01	-0.322***	-0.472***	-0.277**
	(0.04)	(0.02)	(0.055)	(0.119)	(0.113)
Ln(Population)	-0.022**	-0.013	-0.035*	-0.106*	0.071***
	(0.01)	(0.01)	(0.020)	(0.061)	(0.024)
Old population (>=65) share of total	-1.259***	-1.107***	-1.670***	-1.405***	-0.081
	(0.10)	(0.12)	(0.190)	(0.497)	(0.269)
Young population (<=14) share of total	-2.133***	-1.832***	-2.973***	-1.418**	-0.702*
	(0.16)	(0.17)	(0.337)	(0.665)	(0.363)
Spatially lagged tax variable	0.990***	0.981***	0.960***	0.948***	0.983***
	(0.00)	(0.00)	(0.004)	(0.013)	(0.009)
Pre-VAT#Strong institutions	0.252**				
	(0.11)				
Post-VAT#Weak institutions	**1.499*** **				
	(0.10)				
Post-VAT#Strong institutions	**0.898*** **				
	(0.09)				
Pre-VAT#Developed		-0.374			
		(0.27)			
Post-VAT#Developing		**0.412*** **			
		(0.05)			
Post-VAT#Developed [10]		**0.477*** **			
		(0.06)			
Pre-VAT#SSA			-0.220**	0.544**	-0.802***
			(0.102)	(0.258)	(0.304)
Post-VAT#Non-SSA Developing			**0.472*** **	**0.069**	**0.675*** **
			(0.086)	(0.224)	(0.137)
Post-VAT#SSA			**0.494*** **	**-0.356***	**0.484*** **
			(0.092)	(0.208)	(0.141)
_cons	6.436***	5.934***	14.522***	9.110**	2.348
	(0.87)	(0.84)	(1.732)	(4.330)	(2.287)
N	2006	2126	1508	571.000	937.000
AR(1)	0.706	0.502	0.386	0.773	0.549
AR(2)	0.086	0.042	0.055	0.358	0.190
Hansen OIR	0.879	0.684	0.664	0.437	0.536

Standard errors in parentheses, Significance levels * p<0.10, ** p<0.05, *** p<0.010

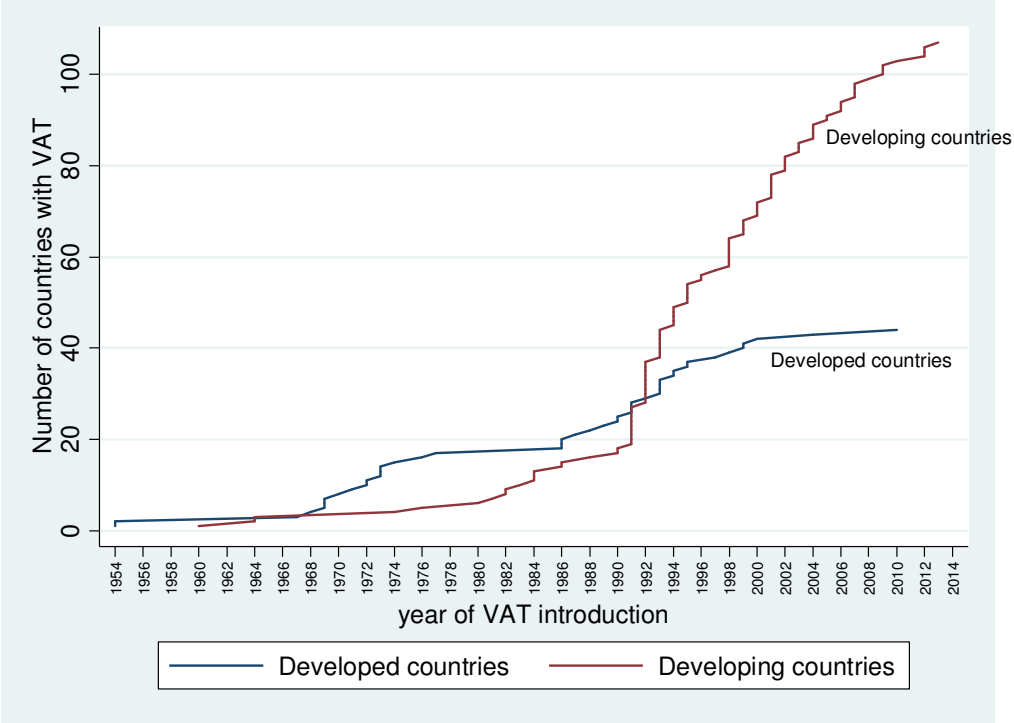
[10]The category of developed countries includes high income countries (OECD & non-OECD)

As we can see from the interaction terms between the VAT dummy and institutional quality, in column 1, VAT adoption yields a significant boost to tax revenue. This is true both for countries with 'weak' and 'strong' institutions. In fact, the marginal contribution of VAT adoption to the increase in tax revenue appears to be slightly higher for countries with 'weak' institutions as compared to the countries with 'strong' institutions. Similarly in column 2, VAT adoption yields a positive impact on tax revenue both for the developing and developed countries, the former benefiting more in relative terms. Although this might appear paradoxical at first sight, there is a simple explanation for it. Although the level of tax revenue before or after VAT is higher in richer countries that have more robust institutions, the poorer countries happen to gain more (relative to their initial tax revenue) following their adoption of VAT.

Another useful coefficient to look at are the coefficients of strong institutions (column 1) and being a developed country (column 2) in the absence of VAT (i.e. pre VAT regime). *Ceteris paribus*, countries with strong institutions earned more tax revenue also in the pre-VAT regime as compared to countries with 'weak' institutions. Similarly, other things remaining constant, developed countries earned more tax revenue as compared to developing countries also in the policy regime before VAT adoption. This supplements the first important observation we made from the figures above.

Column (3), where we use the dataset extending to 2013, shows that VAT adoption has been beneficial to all developing countries - be those in SSA or otherwise. We also see that SSA courtiers earned on average lower tax revenue (in the pre VAT regime) compared to other countries. When we separately analyse the post 2000 period (column 5), we see similar results to column (3), where we use all available years in our dataset. However, when we look at the experience of SSA countries for the period up to 2000 (column 4), the period covered by earlier studies such as Keen and Lockwood (2010), we fail to see the typical gain in tax revenue following VAT adoption. Nearly all countries in the SSA region adopted VAT after 1990 (see Table A2 in Annex) and in those initial years, especially the 1990s, some of them might have had a negative net loss of tax revenue since the tax proceeds from VAT might have not been as big as the tariffs and other trade taxes lost - when replaced by VAT.

Figure 10: Evolution of VAT adoption across developed and developing countries (Cumulative total of countries with VAT)



Perhaps the other variable uniquely focused in this study is also the spatial element of VAT adoption and how this affects tax revenue. The spatially lagged tax variable is positive and highly significant. Again, the implication is that, among other factors - the level of the tax revenue in other countries (especially of closest neighbours) helps to explain the level of tax revenue which we can expect in a given country. As we shall show in the latter parts of our analysis, this is consistently witnessed, be it in countries with 'strong' institutions or 'weak' institutions.

Finally we resort to the rest of the standard list of tax revenue determinants stated in the literature. Openness of the economy has a highly significant positive coefficient in most cases. This goes in line with what is stated in the literature. For instance, Aizenman and Jinjarak (2005) argue that trade openness has a positive effect on VAT collection efficiency. Rodrik (1998) and Keen and Lockwood (2010) also show that more open economies have bigger governments, i.e. they derive bigger share of their GDP as tax revenue. Aizenman and Jinjarak (2006) also note that more open economies might derive more revenue from tax systems such as VAT as they tend to face the consequences of globalization that diminish revenues from traditional taxes such as tariffs and seignorages. Additionally, openness is claimed to have more VAT revenue since the largest chunk of VAT revenues often come from imports, especially in developing countries (Ebril et al., 2001; Smith et al., 2011; Li and Whalley, 2012; Romain et al., 2016).[11]

The share of the agricultural sector in countries' GDP is also consistently negative and highly significant in the last three regressions (i.e. the ones comparing SSA with other developing countries). This is particularly relevant for developing countries where the share of the agricultural sector and the diverse list of informal activities within it are relatively big. The literature claims that the bigger the agricultural sector is, the smaller will be the average tax revenue of a country since the former implies a bigger informal sector (Keen and Lockwood, 2010; Auriol and Warlters, 2012; Ordonez, 2014). This could be explained by the difficulty of taxing activities in the agricultural sector (Martinez-Vasquez and Bird, 2011). Transactions in this sector tend to be small and less monetized, especially in developing countries.

In the literature, the size of the population is used to proxy for the size of a country and a positive link between the two is stated (Keen and Lockwood, 2010; Martinez-Vazquez and Bird, 2011).[12] As Keen and Lockwood (2010) note, having a relatively more 'young' and 'old' demography is also useful determinant of tax revenue, since it is likely to influence the level of tax needed to look after the economically 'dependent' population segments (i.e. those outside the 'working age').[13] The literature focuses on the narrative that countries with more 'dependent' population need to raise more tax revenue to pay for these groups. Persson and Tabellini (2003), Rodrik (1998), Keen and Lockwood (2010) note that there is a positive relationship between the size of old dependent population and the tax ratio. By this analogy, we might (therefore) expect a positive relationship between tax revenue and a bigger proportion of 'dependent' population groups. However, the reality might be more complicated than that and this is not sufficiently highlighted in existing literature.

Both of these two separate dependent population groups (i.e. old & young) share the status of being 'out of the labour market' (implying more tax revenue in order for them to be looked after). They might, however, reflect contrasting realities when we compare the tax and demographic characteristics of rich and poor countries. Rich countries tend to have a significantly 'aged' population group while poor countries have a sizeable 'young' population. Further, we see low tax revenues in developing countries compared to developed ones. Thus, simply looking at the characteristics of developing and developed countries, we should expect a negative relationship between the level of 'younger dependent' population and a positive relationship between 'older dependent' population. These two opposing realities might lead us to believe that the direction of the relationship should not be the same across these two groups.

11 However, there might be some endogeneity issues associated with openness and VAT dummy since more open economies are also more likely to adopt VAT. We try to address these endogeneity issues by using a twostep SYS-GMM regression procedure where we also use the first differences and lags of our endogenous variables as instruments. This procedure is routinely adopted in the literature to tackle endogeneity (e.g. Blundell and Bond, 1998; Raghuram and Subramanian, 2008; Blanco, 2012; Kathavate and Mallik, 2012).

12 However, we can again expect some sort of endogeneity since the size of the country (size of the population) is expected to be inversely associated with openness (Keen and Lockwood, 2010; Rodrik, 1998; Alesina and Wacziarg, 1998).

13 By young population we are referring to people below the age 15 and by old group we are referring to those older than or equal to 65 years of age.

The results in Table 1 show that population (estimated with its log value) indeed has a positive coefficient that is highly (at 1%) statistically significant in both regressions (i.e. columns 1 and 2). As discussed in subsequent sections, this explanatory variable continues to mostly display significant positive coefficients. Going to the coefficients of the young and old proportions of the population, we have a results that is not always consistent. The empirical literature also comes up with inconclusive results regarding these coefficients (e.g. Keen and Lockwood, 2010).

In both regressions, these two variables display significant negative coefficients. This does seem to refute the notion countries with more dependent population need to collect more tax revenue. However, it could make sense to have a negative coefficient for the young population. After all, it is the developing countries that have lower tax ratios and also tend to have a big part of their population within the 'young' dependent population segment. However, as could be seen from the further regressions that address different specifications and robustness issues (subsequent tables), these results are not consistent. For instance, in some of the specifications, these variables (especially the old population segment) display significant positive coefficients. Moving on; country wealth, measured by per capita GDP, is positive and significant in both cases. This evidently shows that developed countries and countries with good institutions have, on average, a higher tax revenue.

2.4 Regressions with various specifications

To be sure that the foregoing preliminary arguments are robust, we analyze regressions involving several specifications in Table 2. Later on, in Table 3, we will conduct another battery of robustness checks that mostly address econometric issues. In Table 2, we experiment with various specifications and see whether the empirical evidences reported in Table 1 generally hold. Specifically, we start with a very basic relationship in the first column and gradually build up by adding further explanatory variables, controls for institutional quality, and interaction terms that involve the VAT dummy, as we go through the rest of the columns.

Although the main econometric issues are addressed latter in Table 3, we deal with some basic issues relating to time effects and spatial effects in Table 2. In this regard, we first run columns 1 and 2 of Table 2 without any spatial or time controls. In columns 3 and 4, we control for time effects by introducing time fixed effects. In columns 5 and 6, we control for spatial effects using the spatial lags of tax ratio. In the last two columns (i.e. columns 7 and 8) we control for institutional quality. For this purpose, we use Political Risk Services International Country Risk Guide (PRS). We also control for spatial effects, along with interaction terms.

As in Table 1, openness displays a positive and highly significant coefficient in most cases. The size of agricultural sector has again a negative and significant coefficient in three of the regressions. It, however, has either non-significant positive coefficients or significant positive coefficients in the rest of the cases. This later result was not expected. Income per capita, as before, has a highly significant positive coefficients in all cases.

Next, we look at the core variables of interest (i.e. the VAT dummy, the spatial effects, institutional effects, development status, interaction terms). Throughout the eight regressions given in Table 2, the VAT dummy displays highly significant positive coefficients as in Table-1. This, once again, confirms that countries have been able to boost their tax revenues following their adoption of the VAT tax system. The coefficients of the spatial lag (see columns 3 to 8) also carries a highly significant coefficient throughout the models. This is again a testament to the strong degree of similarity of tax revenues across countries that are geographically closer to each other. This is easy to grasp as countries that are closer to one other also largely tend to share comparable socioeconomic characteristics - among which are qualities of institutions, tax policies and of course revenue mobilization capabilities.

As can be seen from column 7, the coefficient of the aggregate institutional quality is also positive and significant at 1%. Again, this translates to the simple fact that countries with better institutional set-up tend to have a larger ratio of tax revenue to GDP. In column 8, the six specific measures/indices that make up

the 'aggregate' institutional index are given. Of these, the indices of 'voice and accountability', 'political stability' and 'regulatory quality' have positive and significant (at 1%) coefficients. On the other hand, 'government effectiveness' and 'control of corruption' bear negative and significant coefficients, at 5% and 1% respectively. This unexpected result might be attributed to the distribution of these indices across countries - where, as we explained in section 2 above, most countries (even those countries that normally score better in other indices) score far lower on those two specific indices. Further, 'rule of law' also has a negative but non-significant coefficient.

We also experiment by interacting our VAT variable with our 'economic', 'policy' and 'institutional' variables to see if controlling for these still yields the desired outcome. We find that the interaction terms with openness and spatially lags of tax ratios yield significant (at 1%) positive coefficients. This implies that VAT adoption, coupled with greater openness yields bigger tax revenue. Further, VAT adopting countries that are situated in a geographical neighbourhoods with higher tax revenues (due to VAT adoption in neighbouring countries or other conducive policy settings) can also expect bigger tax revenues - when compared to VAT adopters in a geographical neighbourhoods where tax revenues are (on average) much lower. From the institutional indices, the results show that VAT is predicted to generate more revenue when it is coupled with better 'government effectiveness' and 'control for corruption'. This result is welcome as the separate (non-interaction) coefficients of these two variables were contrary to our expectation (i.e. negative) as discussed above. The rest of the interaction terms either bear non-significant positive coefficients or have significant negative coefficients. However, as discussed above, these variables mostly have the expected signs when their coefficients are estimated separately.

Table 2: Impact of VAT and other determinants on tax revenue regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln(Per capita GDP)	3.520***	0.847***	0.127***	0.153***	0.737***	0.119**	0.626***	0.972***
	(0.18)	(0.25)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.08)
Openness	1.977***	2.021***	0.208***	-0.16	0.384***	0.221***	0.427***	0.560***
	(0.17)	(0.11)	(0.03)	(0.10)	(0.08)	(0.04)	(0.08)	(0.11)
Agriculture (share of GDP)	0.153	-0.490**	-0.025	-0.165**	0.452***	-0.033	0.339***	0.612***
	(0.14)	(0.22)	(0.04)	(0.07)	(0.05)	(0.04)	(0.06)	(0.06)
VAT	1.081***	0.179	0.579***	0.233*	1.290***	0.187	4.006***	21.967***
	(0.08)	(0.11)	(0.07)	(0.13)	(0.09)	(0.11)	(0.84)	(2.87)
Old population (>=65) share of total		5.514***	-1.261***	-1.310***	-0.510***	-1.290***	-0.115	-0.105
		(0.25)	(0.09)	(0.10)	(0.19)	(0.10)	(0.24)	(0.21)
Ln(Population)			-0.001	-0.002	0.098***	-0.007	0.099***	0.137***
			(0.02)	(0.01)	(0.03)	(0.01)	(0.03)	(0.04)
Young population (<=14) share of total			-2.417***	-2.448***	-0.171	-2.441***	0.497	0.554
			(0.13)	(0.17)	(0.33)	(0.14)	(0.39)	(0.35)
Aggregate Institutional Quality							7.940***	
							(2.33)	
Spatially lagged tax variable			0.983***	0.983***	0.996***	0.960***	0.862***	0.823***
			(0.00)	(0.00)	(0.00)	(0.01)	(0.05)	(0.05)
VAT*Openness				0.488***				
				(0.13)				
VAT*Agriculture				0.185***				
				(0.05)				
VAT*Spatially lagged tax						0.025***	0.147***	0.168***
						(0.01)	(0.05)	(0.05)
VAT*Aggregate institutional quality					-0.792***		-9.272***	
					(0.20)		(2.38)	
VAT*Voice and Accountability								-10.922***
								(2.88)
Voice and Accountability								10.683***
								(2.86)
VAT*Political Stability								-25.151***
								(4.45)
Political Stability								22.128***
								(4.62)
VAT*Government Effectiveness								3.572*

								(1.96)
Government Effectiveness								-4.698**
								(2.01)
VAT*Regulatory Quality								-10.209***
								(2.30)
Regulatory Quality								11.107***
								(2.23)
VAT*Rule of Law								0.683
								(1.68)
Rule of Law								-1.089
								(1.70)
VAT*Control of Corruption								11.411***
								(3.72)
Control of Corruption								-10.124***
								(3.73)
_cons	-12.922***	2.135	8.894***	9.145***	-8.030***	9.549***	-12.389***	-33.168***
	(1.83)	(2.39)	(0.68)	(0.86)	(1.69)	(0.71)	(2.11)	(3.82)
N	2164	2126	2126	2126	1161	2126	1161	1161
AR(1)	0.544	0.553	0.497	0.47	0.7	0.508	0.734	0.837
AR(2)	0.059	0.051	0.041	0.043	0.504	0.043	0.522	0.723
Hansen OIR	0.93	0.946	0.899	0.904	0.789	0.906	0.885	0.658

Standard errors in parentheses, Significance levels * p<0.10, ** p<0.05, *** p<0.010

2.5 Robustness checks

In the next table (i.e. Table 3), we will try to cover some of the most important econometric issues that have to be addressed for the sake of robustness. In columns 1 and 2 of the table we try to account for dynamic effects of tax. In these two regressions, we use the log values of our dependent variable. This has been done to overcome issues of dynamic stability seen in the estimations that introduce the dynamic coefficient while using the tax ratio (which is in percentages) as a dependent variable. As can be seen in the table, the coefficients of the lagged tax ratios are positive and significant even at 1%.

In column 3, we use the Hodrick-Prescott procedure to filter our data and control for time trends. In columns 4, we take consecutive five year period averages to control for business cycles and other time related issues of macroeconomic cyclicality. Columns 5 makes extra checks for endogeneity by using residuals from VAT adoption equation. The VAT adoption regressions (which will be discussed further below in this section) run the VAT dummy on most of the similar explanatory variables which we are using to estimate the tax revenue function.

The VAT adoption estimations (see Table 4) are mainly conducted for robustness of our estimates.[14] We plug the residuals of the adoption function in to the revenue function to control for the concerns of endogeneity associated with our empirical exercise. That emanates from the worry that the decision of the VAT take-up could itself be endogenous to the tax ratio for various reasons. For instance, it could be argued that VAT take-up was stronger in countries that already had 'relatively' higher tax revenue ratios. As an exhibit, developed countries were mostly the pioneers in its adoption before developing countries started to adopt it in masse from early 1990s onwards (see Figure 10 above). Further, there could be other confounder factors (e.g. presence of conducive economic, policy or institutional settings) that decide VAT adoption and for the same reason imply higher levels of tax revenues.

Columns 6 and 7 of Table 3 utilize an alternative dependent variable, namely taxes on goods and services (as a ratio of revenues) instead of tax-to-GDP ratio. This is done to make sure that the results are not simply specific to our variable selection. As VAT, by its very nature, is a tax on the production process (value addition) of 'goods and services', the dynamics of this variable should be significantly explained by the adoption of VAT. Further, there is an increasing evidence that VAT revenues have actually become one of the biggest portions of overall tax revenues that countries earn from overall levies on goods and services. As Romain et al. (2016) note, VAT represents about a third of all total tax revenue in many developing countries. Further, OECD (2014) also shows that in many European countries (such as France, UK, Finland, etc.) VAT constitutes about 20% or so of overall tax revenue.

In columns 8 and 9 we once again use our primary dependent variable (i.e. the tax-to-GDP ratio). This time however, we circumvent the data limitation we have for some countries by borrowing a tax database from multiple sources (see Section 2.2).[15] Looking at the results of the foregoing exercises, we see that the VAT and Spatial lag coefficients are again positive and highly significant in most cases. This confirms the main arguments reflected in this paper. Specifically, i) VAT has contributed to the rise in tax revenues of countries; ii) the more efficient the VAT system is, the higher the tax revenue; and iii) the tax revenue in neighbouring countries by itself is a strong indicator for the potential tax revenue that a country is likely to collect.[16]

In Table 4, we run regressions that estimate the major determinants for VAT adoption. Column 1 makes control for time effects by incorporating time dummies among the explanatory variables. Column 2 makes spatial control for the seven geographic regions that our dataset spans. Namely, East Asia & Pacific, Europe

14 However, apart from its mechanical use for robust estimation of (VAT's impact on) the tax revenue function, the results of the VAT adoption equation will enable us to see which economic and institutional characteristics explain early or late adoption of VAT (see also Keen and Lockwood, 2010).

15 Although this database is comprehensive in its coverage of countries (and goes beyond the breadth of the main data we have from IMF WoRLD data), the fact that it is collected from multiple sources (see section 3.3) could create some minor discrepancies.

16 Neighbouring countries share close economic and institutional characteristics. Thus, the level of tax revenue in a country is often a good predictor for the level of tax revenue in the neighbouring countries. Further, a significant part of VAT revenue tends to be collected at national borders. Keen (2008), for instance, shows that many developing countries collect more than half of the gross value of VAT at their borders.

& Central Asia, Latin America & Caribbean, Middle East & North Africa, North America, South Asia, Sub-Saharan Africa. Further, column 3 makes controls for neighbourhood effects of VAT adoption using (inverse of) mean VAT adoption year within geographic regions. Countries are likely to adopt VAT if other countries in their respective region adopt VAT earlier (i.e. in regions where the mean year of adoption is lower). This follows the literature's emphasis on neighbourhood effects in the adoption process (Keen and Lockwood, 2010). Further, the coefficients of columns 1 to 3 represent marginal effects. Generally, the evidence suggests that countries with higher income, population size and institutional quality are more likely to adopt VAT. Further, countries who are located in a regions where there are more early adopters of VAT also tend to follow suite and adopt VAT.

Table 3: Robustness exercises

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ln(Per capita GDP)	0.0004	0.001	-1.793***	1.550***	1.095***	0.023	-0.123***	0.404***	0.39
	(0.01)	(0.01)	(0.33)	(0.17)	(0.29)	(0.03)	(0.02)	(0.04)	(0.29)
Openness	0.050***	0.044***	-0.033	0.840***	1.826***	0.083***	-0.029	0.221***	3.681***
	(0.01)	(0.01)	(0.19)	(0.12)	(0.39)	(0.01)	(0.08)	(0.05)	(0.29)
Agriculture (share of GDP)	0.013**	0.005	-1.776***	0.732***	-0.176	0.138***	0.118***	0.369***	0.458
	(0.01)	(0.01)	(0.27)	(0.16)	(0.28)	(0.02)	(0.05)	(0.05)	(0.39)
Ln(Population)	0.004**	0.005**	-0.676***	0.372***	0.449**		-0.029***		-0.409***
	(0.00)	(0.00)	(0.09)	(0.07)	(0.18)		(0.01)		(0.10)
Old population (>=65) share of total	-0.038**	-0.017	-7.387***	-1.914***	-4.684***		0.234***		3.762***
	(0.02)	(0.01)	(0.74)	(0.61)	(1.27)		(0.06)		(0.74)
Young population (<=14) share of total	-0.125***	-0.099***	-18.060***	-0.577	-8.083***		-0.017		-3.774***
	(0.02)	(0.02)	(1.33)	(0.98)	(1.86)		(0.09)		(1.06)
Aggregate Institutional Quality	0.052	1.727***			17.849**			0.803***	
	(0.04)	(0.18)			(8.15)			(0.17)	
VAT	0.142***	1.083***	9.386***	0.950**	12.655***	0.627***	0.738***	0.029	2.742***
	(0.01)	(0.09)	(0.18)	(0.41)	(4.84)	(0.07)	(0.12)	(0.27)	(0.81)
Spatially lagged tax variable	0.007***	0.010***	0.378***	0.899***	0.610***	-0.002		0.822***	
	(0.00)	(0.00)	(0.02)	(0.02)	(0.05)	(0.00)		(0.02)	
L.Tax	0.041***	0.038***							
	(0.00)	(0.00)							
VAT*Aggregate institutional quality		-1.782***		4.039***	-18.745**				
		(0.18)		(0.72)	(9.14)				
VAT*Spatially lagged tax						0.005		0.138***	
						(0.00)		(0.03)	
VAT*Openness							0.04		-3.040***
							(0.08)		(0.51)
VAT*Agriculture							-0.053		-1.248***
							(0.05)		(0.31)
_cons	2.173***	1.186***	103.523***	-17.443***	13.715	2.337***	3.753***	-3.983***	26.094***
	(0.12)	(0.16)	(7.67)	(4.44)	(10.37)	(0.27)	(0.40)	(0.51)	(4.86)
N	1141	1141	3503	1208	460	1414	1534	1205	3496
AR(1)	0.0002	0.0002	0.0004	0.453	0.533	0.024	0.01	0.474	0.057
AR(2)	0.743	0.824	0.001	0.223	0.827	0.584	0.797	0.595	0.001
Hansen OIR	0.786	0.856	0.964	0.834	0.871	0.955	0.966	0.845	0.979

Standard errors in parentheses, Significance levels * p<0.10, ** p<0.05, *** p<0.010

Table 4: Determinants of VAT adoption

	(1)	(2)	(3)
Ln(Per capita GDP)	0.224***	0.170***	0.273
	(0.020)	(0.020)	(0.180)
Openness	-0.046*	0.015	-0.134
	(0.020)	(0.020)	(0.230)
Agriculture (share of GDP)	0.033	0.074**	-0.289
	(0.020)	(0.020)	(0.200)
Ln(Population)	0.041***	0.088***	0.367***
	(0.010)	(0.010)	(0.100)
Old population (>=65) share of total	0.250***	0.174**	-0.012
	(0.060)	(0.060)	(0.410)
Young population (<=14) share of total	0.588***	0.287*	-0.835
	(0.110)	(0.110)	(0.520)
VAT in neighbours	0.752***	0.654***	
	(0.090)	(0.080)	
IFIs ‡	0.019**	0.011	-0.111
	(0.010)	(0.010)	(0.070)
Aggregate Institutional Quality			2.095**
			(0.750)
VAT in neighbours*Institutional Quality			0.276**
			(0.100)
N	1563	1563	506
log likelihood	-585.771	-526.124	-154.419
chi2	525.45	507.235	218.65
Prob > chi2	0.000	0.000	0.000

Standard errors in parentheses, Significance levels * p<0.10, ** p<0.05, *** p<0.010

NB: VAT adoption is the dependent variable; ‡ The role and degree of interactions with 'International Financial Institutions (IFIs)' is captured by IMF repurchases [17]

2.6 Focus on cross-country institutional differences

The endeavour in Tables 5 and 6 is focused on identifying the possible disparities across institutional clusters. Specifically, we try to see if countries with 'strong' and 'weak' institutions significantly differ in their revenue dynamics and how the adoption of VAT has impacted them. The main rationale behind this is the belief that countries with 'strong' institutions are thought to have benefited more from their VAT adoption. In other words, we try to see if there really is a divergent institutional dimension to the 'money-machine' hypothesis.

In both Tables 5 and 6, the odd columns (1, 3, …, 13) represent countries with 'weak' institutions while the even columns (2, 4, …, 14) represent countries with 'strong' institutions. Further, in Table 5 the institutional clusters (i.e. upper and lower groups) are formed by using a threshold benchmark score (=0.5) for the indices. For the sake of robustness, the clusters in Table 6 are formed using the mean scores for the indices. This later exercise helps us to account for the fact that countries receive, on average, a higher score for some of the indices and score rather badly on the others (e.g. control of corruption as seen in section 2). From the results, we have a consistently positive coefficient for our VAT dummy that is also highly significant in the cluster of countries with 'strong' institutions (see the even columns in Tables 5 and 6). This is true for the country clusters formed using the aggregate institutional index (columns 1 and 2 of

17 In the VAT adoption regression that we estimate, we proxy for the role of international financial institutions (IFIs) by taking IMF repurchases (i.e. to capture the strength of the link between countries and IFIs). This follows the argument that international financial institutions played a key role in encouraging countries to implement VAT (as a tax reform package) to help countries generate adequate revenue and reduce deficits. International institutions such as the IMF have to deal with respective countries if deficit and debt related problems get out of hand, thus, giving them stakes in setting desired policies.

Tables 5 and 6) and also the six specific institutional indices that make up the aggregate index (columns 3 to 14 of Tables 5 and 6).

However, in the set of countries with 'weak' institutional setup, the coefficient of the VAT dummy is mostly not significant (see odd columns of Table 5). This could, however, be due to sampling issues. Specifically, there are often fewer countries that score below the threshold score compared those that score above the threshold. To overcome this, and still be able to somehow account for the difference in institutional quality, we take the countries above and below the average score for each indices in Table 6. This will move the threshold (i.e. what would be considered as a 'strong' institution) for each index based on the distribution of the scores for countries. In other words, some indices such as 'political stability' get a higher threshold (mean of 0.73) while indices like 'government effectiveness' get lower threshold (mean of 0.55). Yet, the results are still fairly the same between Table 6 which considers these index specific thresholds and Table 5 which considers a fixed threshold score (=0.5) as a threshold. The group of countries with institutional scores above the mean reveal a positive and highly significant effect of VAT adoption. Again, in countries with lower institutional score, VAT adoption fails to be robustly significant in most cases.

Table 5: Sample splitting on institutional variables (below & above 0.5)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Institutional cluster variable	Aggregate Institutional Quality		Voice and Accountability		Political Stability		Government Effectiveness		Regulatory Quality		Rule of Law		Control of Corruption	
Institutional Quality	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper
Ln(Per capita GDP)	0.05	0.06	0.1	0.01	3.76	0.12***	0.18	0.13**	0.02	0.10**	0.12	0.03	0.71***	-0.05
	(0.37)	(0.05)	(0.29)	(0.05)	(5.87)	(0.04)	(0.30)	(0.05)	(0.15)	(0.05)	(0.27)	(0.05)	(0.13)	(0.05)
Openness	1.45***	0.13***	1.35***	0.08**	6.36	0.17***	1.35***	0.06	1.38***	0.14***	0.84***	0.18***	0.35***	0.09*
	(0.22)	(0.03)	(0.34)	(0.04)	(4.24)	(0.03)	(0.14)	(0.05)	(0.13)	(0.04)	(0.26)	(0.05)	(0.10)	(0.05)
Agriculture (share of GDP)	0.01	-0.06	0.09	-0.11***	-3.67	-0.02	0.36	-0.08*	-0.44**	-0.03	-0.17	-0.07	0.28***	-0.12**
	(0.32)	(0.05)	(0.20)	(0.04)	(7.12)	(0.04)	(0.30)	(0.04)	(0.20)	(0.04)	(0.15)	(0.05)	(0.11)	(0.05)
Ln(Population)	0.15	-0.02	-0.02	-0.04***	-0.05	-0.01	0.22**	-0.03*	-0.03	-0.01	0.14	-0.03**	0.03	-0.08***
	(0.15)	(0.02)	(0.25)	(0.02)	(1.24)	(0.01)	(0.10)	(0.02)	(0.11)	(0.01)	(0.12)	(0.02)	(0.05)	(0.02)
Old population (>=65) share of total	0.17	-1.41***	0.25	-1.44***	-13.59	-1.36***	-1.00*	-1.29***	-1.15	-1.19***	1.94*	-1.46***	-1.68***	-0.85***
	(1.10)	(0.15)	(1.36)	(0.13)	(33.54)	(0.09)	(0.54)	(0.11)	(0.96)	(0.15)	(0.99)	(0.08)	(0.23)	(0.20)
Young population (<=14) share of total	-0.35	-2.81***	-1.25	-2.85***	-33.46	-2.57***	-2.05**	-2.48***	-2.87*	-2.32***	1.71	-2.97***	-1.76***	-2.59***
	(1.57)	(0.25)	(2.39)	(0.21)	(58.82)	(0.13)	(0.89)	(0.18)	(1.62)	(0.21)	(1.59)	(0.17)	(0.28)	(0.29)
Spatially lagged tax variable	0.88***	0.99***	0.86***	0.99***		0.99***	0.95***	0.98***	0.91***	0.98***	0.96***	0.99***	0.97***	0.99***
	(0.03)	(0.00)	(0.05)	(0.00)		(0.00)	(0.03)	(0.00)	(0.01)	(0.00)	(0.02)	(0.00)	(0.01)	(0.00)
VAT	2.20***	0.47***	2.02***	0.59***	-3.3	0.59***	1.19***	0.52***	0.52**	0.58***	2.22***	0.37***	1.25***	0.21***
	(0.23)	(0.04)	(0.30)	(0.06)	(3.99)	(0.07)	(0.13)	(0.04)	(0.24)	(0.04)	(0.24)	(0.07)	(0.12)	(0.05)
_cons	-2.11	11.34***	3.81	12.36***	142.52	9.76***	2.58	9.71***	14.23	8.78***	-13.14	12.53***	1.01	11.56***
	(8.61)	(1.10)	(14.23)	(1.11)	(294.65)	(0.56)	(5.97)	(0.78)	(9.74)	(0.87)	(8.59)	(1.14)	(1.94)	(1.22)
N	249	1877	247	1879	21	2105	296	1830	167	1959	283	1843	683	1443
AR(1)	0.95	0.52	0.32	0.46	0.370	0.55	0.370	0.31	0.82	0.37	0.19	0.7	0.39	0.9
AR(2)	0.37	0.08	0.29	0.06	0.25	0.06	0.34	0.06	0.33	0.05	0.21	0.07	0.03	0.06
Hansen OIR	0.99	0.91	0.98	0.9	1.00	0.91	0.98	0.92	0.98	0.9	0.97	0.91	0.89	0.92

Standard errors in parentheses, Significance levels * p<0.10, ** p<0.05, *** p<0.010

Table 6: Sample splitting on institutional variables (below & above mean)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Institutional cluster variable	Aggregate Institutional Quality		Voice and Accountability		Political Stability		Government Effectiveness		Regulatory Quality		Rule of Law		Control of Corruption	
Institutional Quality	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper	lower	upper
Ln(Per capita GDP)	0.64***	0.003	1.06***	-0.07	-1.42***	-0.03	0.68***	-0.18**	0.51***	0.02	0.50***	-0.06	0.71***	-0.05
	(0.08)	(0.07)	(0.17)	(0.05)	(0.24)	(0.08)	(0.13)	(0.07)	(0.09)	(0.04)	(0.15)	(0.05)	(0.13)	(0.05)
Openness	0.68***	0.19**	0.69***	0.17**	2.65***	0.05	0.72***	0.03	0.98***	0.08**	0.81***	0.04	0.35***	0.09*
	(0.08)	(0.08)	(0.12)	(0.07)	(0.31)	(0.06)	(0.05)	(0.07)	(0.05)	(0.04)	(0.15)	(0.06)	(0.10)	(0.05)
Agriculture (share of GDP)	0.11	-0.13**	0.94***	-0.27***	-4.00***	-0.1	0.22*	-0.25***	0.01	-0.12***	0.19**	-0.12**	0.28***	-0.12**
	(0.09)	(0.06)	(0.14)	(0.05)	(0.33)	(0.07)	(0.12)	(0.05)	(0.11)	(0.03)	(0.09)	(0.05)	(0.11)	(0.05)
Ln(Population)	-0.01	-0.06**	0.03	-0.04	-0.1	-0.15***	0.09**	-0.11***	0.13***	-0.06***	0.14**	-0.09***	0.03	-0.08***
	(0.04)	(0.03)	(0.06)	(0.02)	(0.13)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.07)	(0.03)	(0.05)	(0.02)
Old population (>=65) share of total	-2.75***	-0.61**	-2.38***	-1.18***	-4.57***	-1.13***	-2.03***	-0.75***	-2.39***	-1.19***	-0.82*	-1.21***	-1.68***	-0.85***
	(0.35)	(0.27)	(0.39)	(0.20)	(1.10)	(0.12)	(0.39)	(0.21)	(0.20)	(0.15)	(0.45)	(0.15)	(0.23)	(0.20)
Young population (<=14) share of total	-3.90***	-1.97***	-3.30***	-2.59***	-13.68***	-2.80***	-3.15***	-2.34***	-3.32***	-2.54***	-1.75***	-2.90***	-1.76***	-2.59***
	(0.45)	(0.40)	(0.60)	(0.31)	(1.84)	(0.20)	(0.62)	(0.31)	(0.28)	(0.29)	(0.64)	(0.20)	(0.28)	(0.29)
Spatially lagged tax variable	0.96***	0.98***	0.95***	0.98***		0.98***	0.94***	0.99***	0.95***	0.99***	0.94***	0.99***	0.97***	0.99***
	(0.01)	(0.00)	(0.02)	(0.01)		(0.00)	(0.02)	(0.00)	(0.01)	(0.00)	(0.02)	(0.00)	(0.01)	(0.00)
VAT	1.57***	0.20***	1.66***	0.41***	2.23***	0.44***	1.30***	0.21***	1.25***	0.44***	1.50***	0.23***	1.25***	0.21***
	(0.07)	(0.05)	(0.10)	(0.04)	(0.33)	(0.08)	(0.11)	(0.04)	(0.09)	(0.03)	(0.13)	(0.06)	(0.12)	(0.05)
_cons	11.96***	8.51***	2.89	12.26***	93.58***	13.62***	6.41**	12.43***	8.90***	11.09***	0.2	13.62***	1.01	11.56***
	(2.60)	(1.72)	(3.18)	(1.37)	(7.86)	(1.13)	(3.21)	(1.28)	(1.92)	(1.51)	(3.78)	(1.06)	(1.94)	(1.22)
N	640	1486	475	1651	499	1627	730	1396	512	1614	527	1599	683	1443
AR(1)	0.45	0.85	0.23	0.64	0.11	0.89	0.47	0.77	0.52	0.91	0.33	0.53	0.39	0.9
AR(2)	0.06	0.09	0.03	0.08	0.22	0.09	0.06	0.1	0.19	0.09	0.07	0.11	0.03	0.06
Hansen OIR	0.96	0.95	0.95	0.95	0.96	0.88	0.91	0.92	0.96	0.92	0.96	0.93	0.89	0.92

Standard errors in parentheses, Significance levels * p<0.10, ** p<0.05, *** p<0.010

3 | Conclusion

The objective of this paper was to examine to which extent the Value- Added Tax (VAT) adoption is a relevant option for developing countries aiming to close their huge financing gap. Further, we examine if having better institutions translates to even more revenue for VAT adopting countries. This effect follows the presumption that, new tax instruments such as VAT would deliver their full revenue potential when they are accompanied by the availability of strong institutions or institutional reforms which would enhance both the demand as well as the supply factors determinants of the tax effort. In doing so, we estimate the relationship between tax revenue (as a share of GDP) and VAT adoption, indices of institutional quality (e.g. accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption) and other various standard determinants of tax revenue (e.g. Country wealth, openness, size of informal sector, population size, share of dependent population, etc.). Especially, we include a spatial lag term to control for regional determinants of tax effort. In this regard, our study complements existing studies on VAT's revenue gain by utilizing a revamped database (that especially adds countries that adopted VAT over the last decade and half to earlier studies) and focusing on the role of good institutions.

Analysis of data from 149 countries over the 1970 - 2013 period indicates that VAT adoption improved tax-revenue collection in both developed and developing (SSA and non-SSA) countries. Moreover, the marginal effect of VAT adoption is estimated to be strong for SSA and other developing countries as compared to their developed counterparts. The positive effect of VAT on tax collection in SSA is reassuring because some earlier studies were not able to identify an overall positive effect for the region. We show that analysis of data over the recent period is important to find a positive effect for SSA. In particular, a sub-period analysis shows that VAT adoption is associated with a decrease in tax collected in SSA prior to the year 2000 whereas in the period post 2000 we have been able to identify a positive relationship between VAT adoption and tax-revenue collection in the region. We argue that the negative impact observed in the first sub-period could be due, for instance, to 'short term' reduction in tax revenue if the immediate revenues from VAT as its adoption does not fully compensate the proceeds of established tax instruments that the VAT is intended to replace (e.g. trade taxes that were common in the past in the region). However, in the medium and long terms the capacity of the tax authorities develops (e.g. electronic scanners, cash register machines, efficient revenue collection bureaucracy, etc.), then the revenue collection from VAT starts to improve significantly in many countries.

As regards the role of institutional quality, we find that, tax-revenue collection is higher in countries with a better-institutional quality - even before VAT adoption. Interestingly, we show that the gain from adopting VAT is maximized in countries that display a better-institutional quality. Given VAT is by now adopted in almost all countries across the world, our findings suggest the need to promote reforms to improve the quality of institutions that facilitate tax collection in developing countries. This is an area where the development cooperation could play a catalytic role to supporting such reforms.

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ANNEX

Annex 1

Table A1: Variable description and summary statistics

Variable and Description	*Source*	*Mean*	*Std. Dev.*	*Min*	*Max*
Tax‡: This is the ratio of total tax revenue to GDP	IMF World Revenue Longitudinal Dataset (WoRLD)	17.506	8.339	0.192	58.115
Ln(Tax‡): This is the natural logarithm of total tax revenue to GDP	Computation using IMF WoRLD data	2.704	0.668	-1.652	4.062
Taxm‡‡: This is the ratio of total tax revenue to GDP	IMF WoRLD; IMF GFS, OECD Tax Statistics; ICTD Government Revenue Database	16.742	8.112	0.192	58.115
Spatially lagged tax variable: This is the spatial lag of the total tax revenue to GDP ratio.	Computation using Tax variables	18.033	8.056	0.946	48.386
Per capita GDP : This is the per capita income of countries (at current $).	WB WDI	10588	12213	207	74021
Ln(Per capita GDP) : This is the natural logarithm of per capita income of countries (at current $).	WB WDI	8.557	1.286	5.331	11.212
Openness: This is the ratio of exports plus imports to GDP.	WB WDI	-0.336	0.553	-2.238	1.491
Agriculture (share of GDP) : This is the share of the agricultural sector in the respective country's GDP.	WB WDI	16.839	14.887	0.000	80.075
Population: This is the size of total population of countries (mill.).	WB WDI	32.10	119.00	0.009	1350.00
Ln(Population) : This is the natural logarithm of size of total population of countries.	WB WDI	15.450	2.077	9.179	21.024
Old population: This is the share of the population aged 65 years of age and older (i.e. proxy for old dependent population) in the total population.	WB WDI	6.742	4.623	0.335	24.398
Young population: This is the share of the population aged below 15 years of age (i.e. proxy for young dependent population) in the total population.	WB WDI	33.196	10.651	12.785	52.099
IMF repurchases: This is IMF repurchases (repo) transactions with member countries (AMT, current $ bill.).	WB WDI	0.899	0.66	0	23.80

Ln(IMF repurchases): This is the natural logarithm of IMF repurchases (repo) transactions with member countries (AMT, current $).	WB WDI	16.651	2.059	9.306	23.893
Aggregate Institutional Quality score (PRS): This index is the average of the six specific governance indices given below	WB WGI project	0.617	0.169	0.107	0.996
Voice and Accountability: This indicator describes to what extent citizens of a country take part in and are capable of genuinely electing their government. It also captures freedoms of media, freedoms association and freedom of expression (Kaufmann et al., 2010).	WB WGI project	0.660	0.247	0.000	1.000
Political Stability and Absence of Violence: This indicator sums the chances of disability to government's authority and the possibility that governments could be unseated via violent or unconstitutional means. It also measures chances of violence rooted in politics and terrorism.	WB WGI project	0.731	0.113	0.227	0.977
Government Effectiveness: This indicator measures the quality of civil service, the quality of public services, and the degree to which such services are free from political pressure (i.e. independent service delivery of public institutions). It also measures the quality of policies designed by governments and to what extent governments are committed to their implementation.	WB WGI project	0.552	0.276	0.000	1.000
Regulatory Quality: This indicator captures the capacity of governments to design (and implement) policies and important regulations that foster private sector development.	WB WGI project	0.675	0.213	0.000	1.000
Rule of Law: This indicator measures the trust economic agents have on national laws and to what extent they abide by them. It captures the quality (and independence) of courts, the police force, and the enforcement of property rights and contracts. It also summarizes the degree of violence and crime in countries.	WB WGI project	0.631	0.223	0.083	1.000
Control of Corruption: This indicator measures the extent to which public resources and power are utilized for personal benefit by government agents. It captures not only the abuses of big magnitude, but also petty crimes. It also tells to what extent the power and resources of the state are captured by the elite and the private sector of countries.	WB WGI project	0.449	0.203	0.000	1.000

NB: ‡Source (IMF WoRLD database), data spans 1990-2014; ⌗ sources (Various), data spans 1970-2014

Table A2: VAT adoption in African countries (Pre and post 2000)

VAT Adoption (pre 2000)		**VAT Adoption (post 2000)**	
Country	**VAT introduction**	**Country**	**VAT introduction**
Ivory Coast	1960	Botswana	2002
Morocco	1986	Burundi	2009
Tunisia	1988	Cape Verde	2004
Kenya	1990	Central African Republic	2001
Mali	1991	Chad	2000
Benin	1991	Congo, Dem. Rep.	2012
Egypt	1991	Djibouti	2009
South Africa	1991	Equatorial Guinea	2004
Algeria	1992	Eritrea	2010
Burkina Faso	1993	Ethiopia	2003
Nigeria	1993	Gambia	2013
Niger	1994	Guinea-Bissau	2001
Madagascar	1994	Lesotho	2003
Togo	1995	Malawi	2002
Mauritania	1995	Mozambique	2008
Zambia	1995	Namibia	2000
Gabon	1995	Rep. of Congo	2012
Uganda	1996	Rwanda	2001
Guinea	1996	Senegal	2001
Tanzania	1998	Seychelles	2012
Ghana	1998	Sierra Leone	2009
Mauritius	1998	Sudan	2000
Cameroon	1999	Swaziland	2013
		Zimbabwe	2004

Source: Alavuotunki and Pirttila (2015); Ernst and Young (2015) and RMCD[18]

Annex 2:

List of countries included in the regressions

Albania; Algeria; Antigua and Barbuda; Argentina; Armenia; Australia; Austria; Azerbaijan, Rep. of; Bangladesh; Barbados; Belarus; Belgium; Belize; Benin; Bolivia; Bosnia & Herzegovina; Botswana; Brazil; Bulgaria; Burkina Faso; Burundi; Cambodia; Cameroon; Canada; Cape Verde; Central African Rep.; Chad; Chile; China, P.R.: Mainland; Colombia; Congo, Republic of; Costa Rica; Croatia; Cyprus; Czech Republic; Côte d'Ivoire; Denmark; Dominica; Dominican Republic; Ecuador; Egypt; El Salvador; Equatorial Guinea; Estonia; Ethiopia; Fiji; Finland; France; Gabon; Gambia, The; Georgia; Germany; Ghana; Greece; Guatemala; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; Hungary; Iceland; India; Indonesia; Iran, I.R. of; Ireland; Israel; Italy; Jamaica; Japan; Jordan; Kazakhstan; Kenya; Korea, Republic of; Kosovo, Republic of; Kyrgyz Republic; Lao People's Dem. Rep; Latvia; Lebanon; Lesotho; Lithuania; Luxembourg; Macedonia, FYR; Madagascar; Malawi; Mali; Malta;

18 The Royal Malaysian Customs Department (RMCD) documents the VAT adoption dates for various countries. http://gst.customs.gov.my/en/gst/Pages/gst_ci.aspx

Mauritania; Mauritius; Mexico; Moldova; Montenegro; Morocco; Mozambique; Namibia; Nepal; Netherlands; New Zealand; Nicaragua; Niger; Nigeria; Norway; Pakistan; Panama; Papua New Guinea; Paraguay; Peru; Philippines; Poland; Portugal; Romania; Russian Federation; Rwanda; Samoa; Senegal; Serbia, Republic of; Seychelles; Sierra Leone; Singapore; Slovak Republic; Slovenia; South Africa; Spain; Sri Lanka; St. Kitts and Nevis; St. Vincent & Grens.; Sudan; Sweden; Switzerland; Tajikistan; Tanzania; Thailand; Togo; Tonga; Trinidad and Tobago; Tunisia; Turkey; Turkmenistan; Uganda; Ukraine; United Kingdom; Uruguay; Uzbekistan; Vanuatu; Venezuela, Rep. Bol.; Vietnam; Zambia; Zimbabwe.