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REMITTANCES, VALUE ADDED TAX AND TAX REVENUE

IN DEVELOPING COUNTRIES

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Summary –. This paper examines the impact of international remittances on both the level and the instability of government tax revenue in receiving countries. It investigates in particular whether the presence of a value added tax (VAT) system increases the benefit of the inflows of remittances in terms of high and less volatile tax revenue ratio. This is supported by the fact that remittances are largely used for consumption purposes and contribute to smoothing private consumption. Using a large sample of developing countries observed over the period 1980-2006, and even after factoring in the endogeneity of remittances and VAT adoption, the results highlight that remittances significantly increase both the level and the stability of government tax revenue ratio in receiving countries that have adopted the VAT.

Keywords: Remittances, VAT, Tax revenue, Tax Revenue Instability

JEL codes: H20, F24, E32, O23

1. INTRODUCTION

One of the most important issues faced by developing countries and which is raised even more seriously today is finding ways to improve the internal mobilization of domestic resources in order to finance public goods. In a context of degradation of public finances in the developed world, the high dependency of developing countries on external development assistance should be addressed and reversed by acting on the ways to efficiently increase the mobilization of domestic resources. In this vein, looking at the ways to improve the mobilization of domestic resources and to build fiscal space in these countries is therefore crucial for the sustainability of public finances and for economic development in general.

If the trend is a stagnation of foreign aid and other forms of development assistance to developing countries, it is worth noting that, at the same time, developing countries receive large amounts of external private transfers, namely migrant remittances. Remittances constitute a bulk of resources received by developing countries and some scholars argue they represent an external and stable source of funding for development (Ratha, 2005). To put some numbers in mind, the level of remittances has attained 338 billions of US dollars in 2008. And despite the recent world wide crisis, remittances have shown a stronger comparative resilience than the other types of financial flows received by developing countries. Moreover, for a number of countries, remittances represent the most important source of external funding, going beyond the levels of foreign aid or foreign direct investment (Ratha, 2009).

A number of studies has analyzed the macroeconomic impact of remittances in terms of growth, poverty, competitiveness and macroeconomic instability in receiving countries. The result showing that remittances significantly reduce poverty rates is largely accepted among scholars (Adams, 2005; Gupta *et al.*, 2009). However, the role played by remittances in enhancing economic growth is still an open debate. If the direct and linear contribution of remittances to economic growth seems difficult to conclude (Chami *et al.*, 2009b), their positive effect on economic growth conditioned upon some factors (the quality of governance and the financial development) is now recognized (Catrinescu *et al.*, 2009; Giuliano and Ruiz-Arranz, 2009; Singh *et al.*, 2009). On average,

remittances also contribute towards reducing the volatility of output and consumption in the receiving countries (Chami *et al.*, 2009a; Combes and Ebeke, *forthcoming*). However, these beneficial macroeconomic effects have a price. Remittances can appreciate the real exchange rate in countries and therefore reduce their external competitiveness (Amuedo-Dorantes and Pozo, 2004; Acosta *et al.*, 2009).

In this macroeconomic literature on remittances, little is said about their consequences on public policy. Two recent papers, however, have questioned the implications of remittance inflows in terms of the sustainability of public finances and economic policy management. Abdih *et al.* (2009) investigated the impact of remittances on the sustainability of government debt using Lebanese fiscal data. Their main result is that the inclusion of remittances in the traditional analysis of the sustainability of the debt alters the amount of fiscal adjustment required to place debt on a sustainable path. They argue that one of the ways remittances can affect fiscal sustainability is the increase of the tax base. Even if they are not taxed directly, remittance flows may indirectly increase the revenue that the government receives from consumption-based and trade-based taxation since they contribute to a higher consumption of domestic and imported goods. This idea has been empirically confirmed by Abdih *et al.* (2010) using panel data for countries in the Middle East, North Africa and Central Asia.

Another paper on the link between remittances and public finances is Chami *et al.* (2008). Using a dynamic general equilibrium model calibrated to match the characteristics of Chilean economy, they showed that the use of a tax on labor income has the undesirable effect of making the government rely more on inflation to appropriate resources as the level of remittances increases. This happens because remittances decrease the labor supply and consequently the labor tax base. In contrast, when the government uses consumption taxation, an increase in remittances leads to an increase in tax revenues through private consumption and the government policy is relatively less distortionary.

The main conclusions of these three recent papers are twofold. Firstly, migrants' remittances might increase the government tax revenue even if they are not directly taxed by the government. Secondly, since remittances enter the receiving economy

through familial transfers they indirectly affect fiscal policy and the debt sustainability through the activities of remittance-receiving households, primarily through their consumption and saving decisions. Abdih *et al.* (2009) stressed that it is in this respect that remittances are different from natural resources, which governments may own and from which they derive revenue, from foreign and domestic public aid, which directly enter the government budget constraint, and from private capital flows that enter directly into the production process.

This paper extends the previous analyses to the whole sample of developing countries. It investigates the contribution of remittances to both the level and the stability of government tax revenue. Since the effects of remittances on tax revenue are essentially indirect (through consumption), this paper therefore examines the role of a value added tax system in the relationship between remittances and total tax revenue ratio.

Two main hypotheses are tested. (i) Without taxing remittances directly, government can enjoy more tax revenue ratios through the VAT system since remittances are largely used for consumption purposes and since the main tax base for VAT is consumption. (ii) Given the positive contribution of remittances to output and private consumption smoothing (Chami *et al.* 2009a; Bugamelli and Paternò, 2009; Combes and Ebeke, *forthcoming*), countries that have adopted a VAT will enjoy less volatile tax revenue ratios thanks to remittance inflows.

This paper raises at least two important debates. Firstly, it explores a new way through which the adoption of a VAT could enhance the level of tax revenue. A recent paper has shown the positive contribution of the VAT to the domestic resource mobilization and its main conclusion is that the VAT is more efficient for tax revenue mobilization the more opened the economy is (Keen and Lockwood, 2010). By looking at another aspect of globalization with remittances, our study complements earlier papers. Secondly, the study examines whether the presence of a VAT is also stabilizing to the extent that it enhances the stabilizing contribution of remittances to the tax revenue ratio. This question seems important to investigate since previous studies have highlighted that the volatility of government tax revenue is quite large for developing

countries (Brun *et al.*, 2006) and leads to an instability of government spending (Lim, 1983; Bleaney *et al.*, 1995; Ebeke and Ehrhart, 2010). To our knowledge, this study is the first one that combines remittances and the VAT-based taxation system to analyze both the dynamic of the level and the volatility of government revenue in the developing world.

To test the two formulated hypotheses, a large sample of developing countries and panel estimators are retained. Whatever the estimator (OLS with fixed effects, Least Squares Dummy Variables Corrected estimator, Difference-GMM estimator and System-GMM estimator), the results do not reject the hypothesis that remittances increase both the level and the stability of government tax revenue in presence of a VAT. These results are also robust to an alternative definition of workers' remittances.

The rest of the paper is organized as follows. Section 2 presents the econometric models of the relationship between remittances, the level and the volatility of the tax revenue ratio. The section also discusses the data that are used and the identification strategy. Section 3 presents and discusses the results and the robustness checks that are conducted. Section 4 concludes on policy implications.

2. EMPIRICAL ANALYSIS

This section presents the specified econometric models, the methodology that is implemented and the data that are used.

2.1. Tax revenue ratio equation

The econometric model

The econometric model of the determinants of the tax revenue ratio is similar to previous studies for the choice of control variables (Gupta, 2007; Mahdavi, 2008 and Keen and Lockwood, 2010). We add two terms to the traditional model: remittances and remittances interacted with a dummy variable for the VAT. More precisely, the specification takes the following form:

$$ty_{i,t} = \alpha + X'_{i,t}\beta + \theta_1 R_{i,t} + \theta_2 R_{i,t} * V_{i,t} + \lambda V_{i,t} + \mu_i + \eta_t + \varepsilon_{i,t} \qquad (1)$$

where $ty_{i,t}$ is the total tax revenue ratio excluding grants (divided by country GDP), R is the remittance ratio (in percentage of GDP) and V a dummy variable which takes the value 1 if there is a VAT in each country i for each year t and 0 otherwise. μ_i, η_t and $\varepsilon_{i,t}$ are the country-specific effect, time-specific effect and the error term, respectively. **X** is the set of control variables. We control for the share of agriculture in GDP that is expected to be negatively correlated with the revenue ratio. It may also serve as a broad indicator of informality and economic development. Openness (measured as the sum of the GDP shares of imports and exports) is also a candidate: Rodrik (1998), for example, finds openness to be positively related to the size of government.[2] We also allow demographic variables–the proportions of the population aged 14 or younger and 65 or over – to play a potential role. These variables may affect the need for the tax revenue to support those out of the labor market. Finally, we control for macroeconomic instability via the inflation rate (measured as the growth rate of the GDP deflator).

In equation (1), the hypothesis tested is that $\theta_1 \leq 0$ and $\theta_2 > 0$ so that the impact of remittances in presence of a VAT ($\theta_1 + \theta_2$) is positive while the impact of remittances on tax revenue ratio in absence of a VAT (θ_1) is negative or null.[3]

Equation (1) is firstly estimated by ordinarily least squares with country and time fixed-effects (OLS-FE). However, this method has important shortcomings in our context. It does not allow to take into account the dynamic properties of the dependent variable (the tax rate) nor does it deal with the endogeneity of some regressors.[4] The endogeneity of remittances is of concern here given that altruistic migrants can send more remittances in order to maintain the purchasing power of their family in their country of origin, especially when the tax burden is too high and reduces the disposal

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[2] Given the importance to the VAT of collection at border points, one might also expect this variable to influence the VAT adoption decision and therefore reduces the selection bias behind the VAT adoption.

[3] The impact of remittances in a context of no VAT is supposed to be negative or null since remittances can reduce labor force participation and therefore reduce the revenue collected from direct taxes (Chami *et al.*, 2008).

[4] Indeed, the tax revenue ratio seems strongly autoregressive year by year given the slow dynamic of changes in the official tax rates in countries.

income. The endogeneity of remittances can also arise in the case of omitted variables. For example, the emigration of individuals can directly reduce the labor tax base and therefore total tax revenues, and at the same time, it determines the amount of remittance inflows.

The endogeneity of the VAT adoption is due to the main motivation behind this reform. Countries choose to adopt a VAT in order to increase the efficiency of the revenue mobilization. Therefore, the VAT adoption is highly predetermined.

To deal with these important issues, we proceed in two steps. Firstly, we adopt a dynamic panel specification of the equation (1). By introducing the lagged value of the tax revenue ratio, we both control for the inertia of the dependent variable and expect reducing the self-selection bias in the VAT adoption. The equation takes the following form:

$$ty_{i,t} = \alpha + \rho\, ty_{i,t-1} + X'_{i,t}\beta + \theta_1 R_{i,t} + \theta_2 R_{i,t} * V_{i,t} + \lambda V_{i,t} + \mu_i + \eta_t + \varepsilon_{i,t} \qquad (2)$$

Given that the OLS-FE estimator is biased due to the presence of both the lagged dependent variable and the country fixed-effects, we use the Least Squares Dummy Variables Corrected estimator (LSDVCE) a method recently proposed by Kiviet (1995), Judson and Owen (1999), Bun and Kiviet (2003), and extended by Bruno (2005), to unbalanced panels such as the one used in this study. This method corrects the bias associated with dynamic panel data model with fixed-effects. The procedure has to be initialized by a consistent estimator to make the correction feasible, since the bias approximation depends on the unknown population parameters. In this study, we initialize the bias correction with the OLS-FE estimator. However, the main drawback is that the estimated asymptotic standard errors may provide poor approximations in small samples, possibly generating unreliable *t*-statistics. The statistical significance of the LSDVCE coefficients is therefore tested using bootstrapped standard errors (with 100 replications).

The second strategy that we adopt to test the robustnessof our results is to control for both the dynamic properties of the tax revenue ratio and the endogeneity of the regressors. Hence an econometric strategy based on instrumental variables must be

implemented. Equation (2) in level and equation (2) in first differences are combined in a system and estimated with an extended GMM estimator system which allows the use of lagged differences and lagged levels of the explanatory variables (remittance terms and VAT dummy) as instruments (Blundell and Bond, 1998).[5]

In order to improve the quality of the instrumentation of the VAT dummy, we augment standard GMM estimation techniques by adding an external instrument for the VAT dummy: for each country, the external instrument is the lagged share of geographical neighbors that have already adopted the VAT for each year t.[6] The lagged value of this variable is used instead of its current value because imitation and neighborhood effects take time. This variable is also interacted with the lagged values of remittance ratio to instrument the interactive term of remittances crossed with the VAT dummy.

For robustness checks, we also conduct estimations using the difference-GMM estimator (Arellano and Bond, 1991). In this context, equation (2) is firstly differentiated to eliminate the fixed-effects and the first-differentiated variables are instrumented by the lagged value of these variables in level. However, our preferred results are derived from the System-GMM estimator which is asymptotically more efficient in small samples.

Data

Tax revenue data are drawn from the IMF Government Financial Statistics database and from several IMF article IV reports. Data exclude grants and are expressed at the General Government level.

We follow the World Bank in defining remittances as the sum of workers' remittances and employees' compensation(s). Workers' remittances properly refer to

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[5] The paper uses the System-GMM estimator developed by Blundell and Bond (1998) for dynamic panel data with the Windmeijer (2005) correction for finite sample bias.

[6] Keen and Lockwood (2010) used a similar variable as an important determinant of the VAT adoption. They also showed that the lagged value of tax revenue ratio significantly and negatively determines the adoption of the VAT. Thus, by controlling in equation (2) for the lagged value of the tax revenue ratio, we reduce the endogeneity of the VAT adoption.

current transfers by migrants who are employed and reside in the countries where they migrated (destination country); employees' compensation should comprise wages, salaries and other benefits earned by individuals in countries different from their resident country (country of origin) and for work performed for and paid by residents of the destination countries. We use the sum of these two items because for many developing countries the statistical distinction between the two could be highly problematic (Bugamelli and Paternò, 2009). However, in order to check the robustness of the results in sub-section 3.3, we test an alternative measure of remittances by using the narrower definition (only workers' remittances).

VAT dummy is constructed according to the information on the dates of the adoption of the VAT that are provided by Ebrill *et al.* (2001) and updated. All the data for the remaining control variables are drawn from World Development Indicators.

2.2. Tax revenue instability equation

Econometric model

The econometric model of the determinants of the instability of tax revenue ratio is similar to previous studies for the choice of control variables (Lim, 1983; Bleaney *et al.*, 1995 and Ebeke and Ehrhart, 2010). We add two terms to the traditional models: remittances and remittances interacted with a dummy variable for the presence of a VAT. More precisely, the specification takes the following form:

$$\sigma_{i,\tau} = \alpha + \phi\sigma_{i,\tau-1} + X'_{i,\tau}\beta + \gamma_1 R_{i,\tau} + \gamma_2 R_{i,\tau} * V_{i,\tau} + \theta V_{i,\tau} + \mu_i + \eta_\tau + \varepsilon_{i,t} \tag{3}$$

where $\sigma_{i,\tau}$ is the standard deviation of the growth rate of the total tax revenue ratio (excluding grants) over the sub-period τ. R is the remittance ratio (in percentage of GDP) and V a dummy variable which takes the value 1 if there is a VAT in each country i for at least 3 years in a sub-period τ. μ_i, η_τ and $\varepsilon_{i,\tau}$ are the country-specific effect, time-specific effect and the error term, respectively. X is the set of control variables, which includes the standard determinants of macroeconomic volatility such as trade openness and the standard deviation of the inflation growth rate (inflation volatility). The hypothesis tested is $\gamma_2 < 0$ and $(\gamma_1 + \gamma_2) < 0$ so that the impact of remittances on the

instability of tax revenue is more negative in the presence of a VAT than without a VAT (γ_1).

We do not control additively for the volatility of the GDP per capita nor for the volatility of household consumption because they represent the main channels for remittances to stabilize the tax revenue ratio. However, to test the fact that the stabilization of private consumption represents the channel for remittances to stabilize the tax revenue ratio in a country that has adopted a VAT, we add to equation (3) the standard deviation of household consumption per capita growth rate. If this channel works, we would get a reduction in the magnitude (in absolute value) and in the significance of the coefficient of the interaction of remittances crossed with the VAT dummy.

The time period of this panel consists of non-overlapping sub-periods of 5 years defined as follows: 1980/1984, 1985/1989... 2000/2005. The variables defined as standard deviation are computed over each of these sub-periods while the other remaining variables are defined in terms of sub-period averages.

The dynamic specification is retained to catch the inertia of the instability of government tax revenue in developing countries. OLS-FE applied to equation (3) leads to biased estimates and we therefore retain the system-GMM estimator.

Endogeneity issues are still of concern here. Regarding remittances, the endogeneity can be explained by the fact that they tend to increase in case of negative shocks that generate macroeconomic instability and therefore government revenue instability. Regarding the VAT, if governments choose this taxation system in order to improve the stability of their tax revenues, there is therefore a self-selection bias. By controlling for the lagged value of tax revenue instability, we partially reduce this bias. However, we will follow the same identification strategy built in the system-GMM framework by instrumenting remittances and the VAT dummy by their lagged values and the share of geographical neighbors with a VAT, respectively. The interactive term of remittances crossed with the VAT dummy is instrumented by the product of lagged values of remittances and the share of geographical neighbors that have adopted the VAT.

Except for the tax revenue data, all the other variables used in equation (3) are drawn from the World Bank Tables. Descriptive statistics of all the variables and the list of countries included in the sample are reported in the appendix.

3. ESTIMATION RESULTS

The first set of results concerns the impact of remittances on the level of tax revenue ratio. The second set of results describes the contribution of remittances to the stabilization of government tax revenue ratio.

3.1. Remittances, VAT and the tax revenue ratio

Table 1 presents the estimations of the impact of remittances on the tax revenue ratio. For each estimator used, the Table informs about the linear impact of remittances and, in every second column, about the impact conditional on the presence of the VAT.

Whatever the estimator used, the results indicate that, on average, remittances do not have a significant impact on the tax revenue ratio. This can be explained by two effects: on the one hand, remittances may increase tax revenue by expanding the private demand (consumption of tradable or non-tradable goods, domestic investment). On the other hand, remittances could reduce the labor supply and increase leisure time at home (Chami *et al.*, 2005). It results a contraction of the domestic production and therefore in a sharp decrease in tax revenue ratios for countries that exclusively depend on corporate and individual taxes (Chami *et al.*, 2008) but not on VAT.

Table 1. about here

The story changes when remittances are interacted with the VAT dummy. Whatever the estimator used, the interactive term of remittances is statistically significant and exhibits a positive sign. It is important to keep in mind that the coefficient of the additive term of remittances identifies the impact of remittances in countries without a VAT. The sum of the two coefficients associated with remittances gives the impact for countries that have a VAT system. It emerges that the contribution of remittances in countries without a VAT is never statistically significant. This is consistent with the previous papers already quoted. In contrast, remittances seem to

significantly increase the tax revenue ratio when countries have implemented a VAT system.[7]

When we turn to our preferred estimations by the system-GMM method (columns [1.7] and [1.8]), the results indicate that the impact of remittances in country with a VAT stands at 0.08. Perhaps a better sense of the quantitative significance of this coefficient can be obtained from the following calculation. The median share of the remittance ratio in our sample is around 1.8 %GDP. A shift from the median toward the 75th percentile of the distribution of the remittance ratio (an increase from 1.8 to 5.3 %GDP) which corresponds to a variation of 3.5 percentage points of GDP would lead to an increase in the total tax revenue ratio by 0.3 %GDP in a country that has a VAT system.

3.2. Remittances, VAT and the instability of the tax revenue ratio

Table 2 presents the estimation of the impact of remittances on the instability of the tax revenue ratio. The estimator used is the system-GMM since remittances are taken as endogenous and the instability of tax revenue appears strongly autoregressive in the sample. Column [2.1] reports the linear (unconditional) impact of remittances on the instability of the tax revenue ratio. The results indicate a non significant stabilizing effect of remittance inflows.

In column [2.2], the VAT dummy is introduced additively and in interaction with the remittance ratio. Three important results emerge. Firstly, the presence of a VAT appears stabilizing. Countries that have adopted a VAT (and whatever their characteristics, such as openness, the level of development, governance quality or remittance levels), enjoy more stable tax revenue than the others. This result complements early studies on the fiscal impact of the VAT adoption. For instance, Keen and Lockwood (2010) showed that the VAT adoption is a factor enhancing the efficiency of the tax revenue collection.[8] Our results indicate that the VAT is not only a determinant

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[7] Table 1 reports the sum of the two coefficients associated with remittances and this sum is always positive and statistically significant in the case of OLS-FE, LSDVC and System-GMM results.

[8] More precisely, they showed that the positive effect of the VAT on the tax revenue is conditional on the degree of trade openness and the level of economic development.

of the level of the tax revenue ratio, but also a tax revenue stabilizer. Since the VAT is based on a macroeconomic aggregate (consumption) that is relatively more stable, countries that rely on this tax instrument would have less volatile tax revenue. This result posits the VAT as an effective determinant of overall fiscal performance (measured as the level of mobilization of revenue and the stability of these revenues) in developing countries.

Table 2. about here

Secondly, the additive term of remittances which measures the impact of these flows on the instability of tax revenue in countries without a VAT system, appears not to be statistically significant although it is negative. This is in line with our expectations. Indeed, if remittances stabilize private consumption over time, countries that do not tax consumption via a VAT system would not take advantage of the stabilizing effects of remittance inflows on private consumption.

Thirdly, the results of column [2.2] indicate a stabilizing effect of remittances on tax revenue in countries with a VAT. The impact is negative (the sum of the two remittances coefficients) and stands around -0.28.[9] In column [2.3], we test whether this stabilizing contribution of remittances passes through the stabilization of private consumption. Hence, the model includes the instability of the household consumption per capita growth. As expected, its effect on the tax revenue instability is strongly positive and significant. The inclusion of this variable, however, deteriorates the significance of the remittance coefficients. This confirms our guess that one of the main channels through which remittances could stabilize government tax revenue in countries with a VAT system is through their consumption smoothing properties.

3.3. Robustness checks

One of the main difficulties that arise in the macroeconometric works on remittances is the measurement error in the remittance variable. Remittances data are essentially underreported for many countries due to the existence of informal channels.

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[9] In Table 2, the results of the Wald-test of the joint significance of the two remittance coefficients indicate a significant effect at almost 5%.

Another concern is the fact that many empirical papers that used World Bank data define remittances as the sum of workers' remittances and employees' compensations. The main justification is that, for many countries, the distinction between workers' remittances and employees' compensations is difficult to make. Nevertheless, we test the robustness of all the previous results, with an alternative definition of remittances by only using the narrower definition. We define remittances in this section as current transfers by migrants who are employed and resident in the countries where they migrated (destination country). Data are drawn from the IMF Balance of Payments Yearbook (various editions). As previously, remittance values are normalized by country GDP.

Table 3 reports the results of the impact of remittances on the tax revenue ratio. The results appear broadly the same than those of Table 1. When remittances are included additively, and whatever the estimator (OLS-FE, GMM), they do not exhibit a significant coefficient. In contrast, the conditional effect of remittances on the tax revenue ratio is statistically significant. Indeed, the interaction term of remittances is positive and significant, and this result confirms the proposition that remittances tend to significantly increase the tax revenue ratios in countries that have already adopted a VAT system. The contribution of remittances in countries with a VAT stands around 0.05 (column [3.6] in the case of system-GMM estimations).

Table 3. about here

Table 4 reports the results of the impact of remittances on the instability of the tax revenue ratio. The results remain qualitatively the same as those of Table 2. The inclusion of remittances additively doesn't lead to any stabilizing effect (column [4.1]). However, when the model enables to include the interactive term of remittances crossed with the VAT dummy, the stabilizing contribution of remittances is observed. The value of the coefficient of remittances for countries that have adopted the VAT (the sum of the two remittance coefficients) stands at -0.38 (column [4.2]), a value close to that of Table 2 (-0.28). In column [4.3], the inclusion of the instability of consumption per capita leads to a deterioration of the significance of the coefficients of interest. The consumption smoothing channel is then empirically confirmed by the data.

Table 4. about here

4. CONCLUDING REMARKS

This paper showed robustly that remittances can increase both the level and the stability of government tax revenue in receiving countries. However, these positive effects on fiscal performance are *only* conditional on the presence of the value added tax system (VAT) in the remittance dependent countries. Even after factoring in the endogeneity of remittances and the adoption of the value added tax, or even after using an alternative measure of remittances, the results still remained robust.

The results interestingly add to the positive link between remittances and debt sustainability analysis in receiving countries (Abdih *et al*., 2009). They are important for at least two reasons. Firstly, they showed that public authorities can take advantage of remittance inflows without taxing them directly, and without creating distortions and reducing incentives to remit. The presence of a VAT is therefore useful to capture the positive effect of remittances on consumption smoothing. Secondly, we got clear policy implications: the adoption of a VAT and measures to increase its effectiveness in remittance dependent countries can help build fiscal space given the significant coefficient of transformation of remittances into tax revenue in countries that have adopted a VAT system.

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Table 1: Remittances, VAT and the tax revenue ratio.

Period:	1980-2006							
Unit of observation:	Years							
	OLS-FE		LSDVCE		Difference-GMM		System-GMM	
	[1.1]	[1.2]	[1.3]	[1.4]	[1.5]	[1.6]	[1.7]	[1.8]
Remittances (% GDP)	0.006	-0.021	0.005	-0.003	0.128	0.057	-0.025	-0.033
	0.11	0.53	0.56	0.67	1.05	0.76	0.23	0.56
Remittances * VAT		0.116**		0.042***		0.165*		0.116**
		2.21		6.52		1.69		2.44
VAT dummy		-0.859		-0.032		-3.050**		-1.631
		1.12		0.54		2.13		1.47
Tax revenue % GDP (t-1)			0.759***	0.730***	0.656***	0.593***	0.636***	0.638***
			46.66	69.22	7.95	6.80	7.78	9.86
Agriculture value added (% GDP)	-0.208***	-0.204***	-0.054***	-0.053***	-0.238*	-0.471**	-0.253**	-0.341***
	3.53	3.63	4.33	8.26	1.95	2.57	2.27	2.80
Trade openness	0.069***	0.071***	0.030***	0.032***	-0.053	-0.052	0.018	0.025
	3.05	3.16	9.12	18.88	1.29	1.25	0.83	1.35
Population aged 14- (%)	0.076	0.073	0.074***	0.092***	0.035	0.037	0.290*	0.364**
	0.50	0.47	3.76	8.27	0.26	0.21	1.77	2.24
Population aged 65+ (%)	-0.417	-0.506	0.230*	0.248***	0.749	-0.361	0.636**	0.709***
	0.58	0.78	1.77	3.80	1.36	0.41	2.24	2.58
log (1+Inflation)	-1.109	-1.107	-0.084	-0.114	0.207	-0.117	-1.079*	-1.103*
	1.22	1.22	0.58	1.56	0.47	0.20	1.73	1.85
Intercept	19.545**	20.135**					-1.760	-2.586
	2.37	2.56					0.25	0.45
No observations	1702	1702	1640	1640	1526	1492	1640	1600
No countries	98	98	98	98	95	95	98	95
Ho: $\theta_1+\theta_2=0$, p-value		0.093		0.000		0.232		0.016
$\theta_1+\theta_2$		0.09		0.04		0.222		0.083
First order serial correlation p-value					0.000	0.000	0.000	0.000
Second order serial correlation p-value					0.301	0.271	0.204	0.177
Hansen OID test p-value					0.114	0.214	0.095	0.251
No instruments					17	22	15	20

Note: Absolute t-statistics are presented below the corresponding coefficients. Symbols ***, ** and * means significant at 1%, 5% and at 10%. **Dependent variable: Total tax revenue (excluding grants) in percentage of GDP.** LSDVCE means the Least Squares Dummy Variable Corrected Estimator initialized by the OLS-FE estimator. In the system-GMM and difference-GMM framework, the additive term of remittances is taken as endogenous and instrumented by its lagged values. The VAT dummy and the interactive term remittances*VAT are instrumented by the proportion of geographical neighbors with a VAT and by this variable crossed with lagged values of

remittances, respectively. Two-steps GMM estimator with the Windmeijer (2005) correction for finite sample bias is implemented.

Table 2: Remittances, VAT and the instability of the tax revenue ratio.

Period	1980-2005		
Unit of observation:	Non-overlapping 5-year averages		
	[2.1]	[2.2]	[2.3]
Remittances (%GDP)	0.425	-0.038	-0.004
	1.02	0.36	0.04
Remittances * VAT		-0.245*	-0.185
		1.72	1.53
VAT dummy		-4.525*	-2.377
		1.79	1.07
Instability of tax revenue (t-1)	0.205	0.297**	0.202**
	1.52	2.51	2.29
Trade openness	-0.027	-0.007	-0.025*
	1.36	0.46	1.74
Instability of inflation rate	0.006***	0.006***	0.006***
	7.42	15.58	14.49
Instability of private consumption			0.194**
			2.16
Intercept	9.366***	10.075***	9.738***
	4.76	5.37	5.45
No observations	269	241	235
No countries	96	89	87
Ho: $\gamma_1+\gamma_2=0$, p-value		0.055	0.161
$\gamma_1+\gamma_2=0$		-0.283	
First order serial correlation p-value	0.123	0.093	0.108
Second order serial correlation p-value	0.275	0.301	0.374
Hansen OID test p-value	0.215	0.460	0.387
No instruments	14	20	21

Note: Absolute t-statistics are presented below the corresponding coefficients. Symbols ***, ** and * means significant at 1%, 5% and at 10%. **Dependent variable: Instability of total tax revenue ratio growth rate (excluding grants)**. The VAT dummy takes the value 1 if there is a VAT in at least 3 years in a considered sub-period and 0 elsewhere. In the system-GMM and difference-GMM framework, the additive term of remittances is taken as endogenous and instrumented by its lagged values. The VAT dummy and the interactive term remittances*VAT are instrumented by the proportion of geographical neighbors with a VAT and by this variable crossed with lagged values of remittances, respectively. Two-steps GMM estimator with the Windmeijer (2005) correction for finite sample bias is implemented. Time dummies are included in all specifications.

Table 3: Remittances (excluding compensations of employees), VAT and the tax revenue ratio.

	OLS-FE		Difference-GMM		System-GMM	
Period	1980-2006					
Unit of observation:	Years					
	[3.1]	[3.2]	[3.3]	[3.4]	[3.5]	[3.6]
Remittances (% GDP)	0.115	0.034	-0.473	-0.059	-0.131	-0.070
	1.56	0.39	1.44	1.15	1.43	1.27
Remittances * VAT		0.160*		0.145**		0.122**
		1.84		2.07		2.05
VAT dummy		-1.512**		-1.600**		-1.795**
		2.10		2.32		2.26
Tax revenue % GDP (t-1)			0.501***	0.595***	0.612***	0.598***
			3.88	6.99	10.62	11.81
Agriculture value added (% GDP)	-0.212***	-0.217***	-0.401**	-0.231**	-0.186	-0.302***
	4.70	5.10	2.17	2.51	1.49	2.76
Trade openness	0.086***	0.091***	0.037**	0.044***	0.045***	0.034***
	4.10	4.40	2.16	3.17	3.83	2.65
Population aged 14- (%)	0.133	0.102	0.251*	0.154	0.255	0.322***
	0.83	0.65	1.75	1.54	1.58	2.89
Population aged 65+ (%)	-0.861	-0.908	0.206	-0.124	0.608**	0.645***
	1.01	1.18	0.36	0.40	2.42	2.98
log (1+Inflation)	-1.131	-1.160	-0.465	-0.367	0.256	0.224
	1.36	1.41	0.72	0.63	0.58	0.53
Intercept	17.739*	19.707**			-3.071	-1.390
	1.89	2.24			0.73	0.39
No observations	1746	1746	1558	1530	1674	1645
No countries	96	96	96	96	96	96
Ho: $\theta_1+\theta_2=0$, p-value		0.025		0.100		0.114
$\theta_1+\theta_2$		0.194		0.086		0.052
First order serial correlation p-value			0.003	0.000	0.000	0.000
Second order serial correlation p-value			0.324	0.218	0.280	0.264
Hansen OID test p-value			0.688	0.350	0.147	0.368
No instruments			12	20	12	16

Note: Absolute t-statistics are presented below the corresponding coefficients. Symbols ***, ** and * means significant at 1%, 5% and at 10%. **Dependent variable: Total tax revenue (excluding grants) in percentage of GDP**. In the system-GMM and difference-GMM framework, the additive term of remittances is taken as endogenous and instrumented by its lagged values. The VAT dummy and the interactive term remittances*VAT are instrumented by

the proportion of geographical neighbors with a VAT and by this variable crossed with lagged values of remittances, respectively. Two-steps GMM estimator with the Windmeijer (2005) correction for finite sample bias is implemented.

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Table 4: Remittances (excluding compensations of employees), VAT and the instability of the tax revenue ratio.

Period	1980-2005		
Unit of observation:	Non-overlapping 5-year averages		
	[4.1]	[4.2]	[4.3]
Remittances (%GDP)	-0.125	0.391	0.283
	0.64	1.16	0.63
Remittances * VAT		-0.775**	-0.524
		2.07	1.16
VAT dummy		-1.252	-2.677
		0.43	1.00
Instability of tax revenue (t-1)	0.240**	0.168**	0.168**
	2.12	1.96	2.51
Trade openness	0.061	0.089	0.023
	0.72	0.96	0.23
Instability of inflation rate	0.006***	0.006***	0.006***
	6.72	10.26	7.56
Instability of private consumption			0.186*
			1.69
Intercept	6.014	4.607	7.268
	1.29	0.92	1.60
No observations	269	252	243
No countries	93	88	85
Ho: $\gamma_1+\gamma_2=0$, p-value		0.024	0.267
$\gamma_1+\gamma_2=0$		-0.384	
First order serial correlation p-value	0.114	0.146	0.133
Second order serial correlation p-value	0.248	0.305	0.400
Hansen OID test p-value	0.773	0.761	0.796
No instruments	14	19	20

Note: Absolute t-statistics are presented below the corresponding coefficients. Symbols ***, ** and * means significant at 1%, 5% and at 10%. **Dependent variable: Instability of total tax revenue ratio growth rate (excluding grants)**. The VAT dummy takes the value 1 if there is a VAT in at least 3 years in a considered sub-period and 0 elsewhere. In the system-GMM and difference-GMM framework, the additive term of remittances is taken as endogenous and instrumented by its lagged values. The VAT dummy and the interactive term remittances*VAT are instrumented by the proportion of geographical neighbors with a VAT and by this variable crossed with lagged values of remittances, respectively. Two-steps GMM estimator with the Windmeijer (2005) correction for finite sample bias is implemented. Time dummies are included in all specifications.

DATA APPENDIX

Summary statistics :

	Annual observations				
Variables	Obs.	Mean	Std dev.	Minimum	Maximum
Tax revenue % GDP	2341	20.38	9.03	1.30	70.90
Remittances and Compensations % GDP	2463	4.74	8.35	0	90.42
Remittances % GDP	2561	2.81	5.23	0	41.51
VAT dummy	3888	0.38	0.48	0	1
Percentage of other VAT adopters in the region	3888	37.68	28.59	0	100
Agriculture value added share (%)	3104	23.18	14.51	1.61	93.98
Trade openness (%)	3181	75.48	39.62	1.53	280.36
Population aged 65+ (%)	3648	4.89	2.89	1.89	17.32
Population aged 14- (%)	3648	38.14	8.44	13.57	51.92
log (100+inflation rate)	3295	0.20	0.47	-0.34	5.59
	5-year averaged observations				
Tax revenue instability	427	13.38	13.95	0.52	195.78
Remittances and Compensations % GDP	483	4.52	8.12	0	78.68
Remittances % GDP	514	2.67	4.86	0	33.15
VAT dummy	720	0.35	0.48	0	1.00
Percentage of other VAT adopters in the region	720	35.16	27.14	0	89.58
Trade openness (%)	606	74.70	38.36	2.35	226.87
Inflation instability	619	104.00	655.15	0.50	11158.63
Instability of real private consumption per capita growth rate	550	8.44	27.05	0.37	617.30

Countries in the sample (98): Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Belize, Benin, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Rep., Chad, Chile, China, Colombia, Comoros, Congo Rep., Costa Rica, Cote d'Ivoire, Djibouti, Dominican Rep., Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Fiji, Gabon, Gambia, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, India, Indonesia, Iran, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyz Rep., Lao PDR, Lebanon, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Rwanda, Senegal, Sierra Leone, South Africa, Sri Lanka, Sudan, Suriname, Swaziland, Syrian Arab Rep., Tajikistan, Tanzania, Thailand, Togo, Tonga, Tunisia, Uganda, Ukraine, Vanuatu, Vietnam, Yemen Rep., Zambia, Zimbabwe.