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Fiscal Resilience Building: Insights from a New Tax Revenue Diversification Index

Ali Compaoré, Rasmané Ouédraogo, Moussé Sow, and René Tapsoba

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Fiscal Resilience Building: Insights from a New Tax Revenue Diversification Index[1]

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Disclaimer: This document was prepared before COVID-19 became a global pandemic and resulted in unprecedented economic strains. It, therefore, does not reflect the implications of these developments and related policy priorities. We direct you to the **IMF Covid-19 page** that includes staff recommendations with regard to the COVID-19 global outbreak.

Abstract

Does the reliance on diversified tax structure enhance resilience to fiscal risks? This paper gives an answer to this question by proposing a new cross-country tax revenue diversification index (RDI). The RDI builds on the Theil index, and unlike the few existing tax diversification indices, which are constructed only at the state level for the US, is computed at the national level, covering a broad panel of 127 countries over the period 2000-15. We find suggestive evidence that tax revenue diversification reduces tax revenue volatility, thus bringing to the data long-held views about the prominence of tax revenue diversification for fiscal resilience strengthening. While exploring the drivers of the RDI, we find that tax revenue diversification is not just a reflection of economic diversification, but also an outcome of macroeconomic, political and institutional factors. Interestingly, a non-monotone relationship is also at play between the RDI and economic development, with countries' portfolio of tax sources getting more diversified as their economy develops, until a tipping point, where richer countries start finding it harder to diversify further their tax revenue sources.

JEL Classification Numbers: C43, H20, H21, O11, O17
Keywords: Revenue volatility, Taxation, Tax revenue diversification, Theil Index.

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I. INTRODUCTION

Securing stable domestic resources is part of the multiple objectives of tax policy.[3] Strengthening resilience to fiscal risks arising from government revenue volatility is critical for ensuring a sustainable delivery of public services throughout different phases of the business cycle. A large body of the literature shows that government revenue volatility weighs on economic growth and welfare, including through its adverse effects on the stability of public spending (Bleaney and others, 1995; Furceri, 2007; and Loayza and others, 2007). Delinking public spending from revenue volatility, through the implementation of rules-based fiscal frameworks, is referred to as a credible option for indirectly strengthening resilience to government revenue volatility (IMF, 2009; and Budina and others, 2012). Although not analytically grounded, a long-held intuitive view suggests that tax revenue diversification, that is the reliance on more diversified sources for levying revenue, can serve as an alternative for tackling more directly the root causes of government revenue volatility. The basic tenet is that given the responsiveness to the business cycle fluctuations varies across taxes, relying on a more diversified portfolio of tax streams makes the government's overall tax revenue less subject to as large volatility as compared to relying on a concentrated portfolio of tax sources.[4]

The current coronavirus pandemic comes as a vivid reminder about the criticality of relying on a diversified portfolio of tax revenue streams. Besides the thousands of lives lost, the pandemic caused severe economic turmoil worldwide, limiting policymakers' ability to levy much-needed revenues to contain the spread of the virus and properly address its economic and social consequences, especially in countries where tax collection rests largely on a few instruments and/or economic sectors. The pandemic thus illustrates the fragility of public policies built around a concentrated portfolio of tax revenue streams, given the high vulnerability of such tax systems to large swings in the business cycle. It follows that the long-held intuitive view about the pivotal role of a more diversified tax structure for securing stable resources needed to bridge large infrastructure gaps, expand social safety nets and improve countries' preparedness to future crises, appears more than ever reinvigorated.

But is this long-held intuitive view borne out by the data? A few existing studies find evidence supportive of the view that greater tax diversification is conducive to lower revenue shortfalls during recessions (Suyderhound, 1994; and Carroll, 2005) and lower tax revenue volatility (Schunk and Porka, 2005). But other studies found limited evidence supportive of this view in the US during the recent Great Recession (Kilby, 2014). That said, all these few existing studies relied on Herfindahl-Hirschman (HHI)-based revenue diversification indices computed at the state level for the US. Other studies captured tax diversification indirectly, including through the share of tax revenue coming from the extractive sector (see e.g., IMF, 2016).

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[3] The desired mix of taxes is country and context specific. It is a delicate balancing act between several factors, including ensuring the efficiency and fairness of the tax system, securing stable government resources, accounting for tax administration's capacity to collect, and the political cost of levying taxes (Groves and Kahn, 1952; White, 1983; Hettich and Winer, 1984; Auerbach, 1985; Gentry and Ladd, 1994; and Gaspar and Selassie; 2017).

[4] Some studies show that personal income taxes are more responsive to the business cycle fluctuations compared to indirect taxes (value added tax or sales tax), property taxes, and excises, respectively (Groves and Kahn, 1952; Wilford, 1965; and Williams and others, 1973).

This paper refreshes the literature by proposing a new cross-country tax revenue diversification index (RDI). To the best of our knowledge, this is the first study to construct a homogenous cross-country dataset capturing directly the diversification of tax sources structure. Our proposed RDI is computed at the national level, covering a broad panel of 127 countries over 2000-15, based on data availability. We focus on tax revenue, leaving non-tax revenues aside, as non-tax revenues are not primarily designed for revenue-enhancing purposes, but rather to get consumers' incentives right.[5] The construction of the RDI rests on six major categories of taxes, as reported in the GFSM 2014, namely corporate income tax (CIT), personal income tax (PIT), property tax, tax on goods and services, tax on international trade, and other taxes. Another novelty of the paper is that our RDI builds on the Theil index (as opposed to the HHI), which offers more interesting properties, notably in terms of stability and robustness to outliers.[6] Finally, this paper sheds light not only on the stability-enhancing role of tax revenue diversification, but also on the RDI drivers.

Key stylized facts stand out on the RDI dynamics. On average, AEs relied on more diversified structure of tax sources than EMEs and LIDCs, by as high as the double in terms of RDI over the period 2000-15. Resources-rich countries and fragile states exhibit the most concentrated structure of tax sources, reflecting their over-dependence on commodity revenues and weak tax administration capacity, respectively. Regional disparities in the RDI are also noticeable, with North American and EU countries exhibiting the most diversified taxation sources, while GCC, South Asian, Latin American, and Sub-Saharan African countries present the least diversified revenue streams.

We also uncover the following results from our econometric analyses. First, the RDI exhibits high persistency over time, with up to 60-74 percent of the current level of RDI predicted by its lagged value. Second, our empirical investigations suggest that tax revenue diversification is not just a reflection of economic diversification, but also the outcome of macroeconomic, political and institutional factors. A non-monotone relationship is also at play between the RDI and economic development, with countries' portfolio of tax sources getting more diversified as their institutions and tax administration capacity keep improving, until a tipping point, where richer countries start finding it more difficult to diversify further their sources of tax revenue. Third, and not the least, our findings lend support to the long-held view that tax revenue diversification matters a great deal for mitigating government revenue volatility. And it does not stop there: tax revenue diversification also improves tax revenue collection.

The remainder of the paper is structured as follows. Section II introduces the data, while section III lays out the detailed steps of the construction of the RDI, and highlights key patterns standing out from the RDI, along with a few pair-wise correlations. Section IV explores the drivers of the RDI, while section V assesses its effects on both volatility and level of government revenue. Section VI presents some concluding remarks.

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[5] Over-relying on non-tax revenue can prove quite distortive. As a general principle, a user fee should be set such that it covers the cost of services provision, but not to finance other expenditure. That said, we also computed an adjusted RDI (see Annex 7) that accounts for non-tax revenue, given the latter can be substantial in resources-rich countries (dividends, royalties, interest). The adjusted RDI is highly correlated with the main RDI (correlation coefficient of 0.80). For robustness check, we also control for a resources-rich dummy in the econometric analysis (Table 5, column 5).

[6] Our approach follows the recently created export diversification indices (Cadot and others, 2011; Papageorgiou and Spatafora, 2012). But for robustness purposes, we also construct an HHI-based RDI (see Annex 6).

II. DATA

2.1. The GFS database

Our sample covers 127countries from all regions and across all income groups, based on data availability over the period 2000-15. It is made up of 47 advanced economies (AEs), 31 Emerging Market Economies (EMEs), and 49 low-income developing countries (LIDCs). 25 are from Sub-Saharan Africa (SSA), two from North America (NA), 7 from South Asia (SA), 19 from Latin America & the Caribbean (LAC), 14 from the Middle East & North Africa (MENA) (of which 5 from the GCC), 21 from East Asia & Pacific (EAP), and 39 from Europe & Central Asia (ECA) (See Annex 1).

We rely on the IMF's Government Financial Statistics (GFS) dataset to extract tax revenue data. The GFS dataset provides detailed public finance data in line with international standards (GFSM 2014), thus allowing for comparability across countries and over time (Aldasoro and Seiferling, 2014). The GFSM 2014 represents the latest internationally accepted methodology for compiling government finance statistics in a systematic manner, with well-established definitions and classifications.

The GFS presents additional appealing features. First, data from the GFS are actual, not estimates or projections as in the IMF's WEO. Second, unlike alternative databases (WEO, ICTD), the GFS provides the most detailed classification of government's tax revenues for a large coverage across countries and over time. Third, the GFS is compiled by the IMF's Statistics Department, which ensures consistency across countries, the quality and the accuracy of data under a common methodology for all countries.[7]

2.2. Tax revenue components

The GFS provides the most comprehensive and detailed cross-country data in a uniform format. Table 1 below provides an overview of tax revenue classification along the GFSM 2014 format.[8]

Given data limitations, notably for LIDCs, we restrict data disaggregation to a level that ensures a reasonably large but homogenous sample. We focus on tier-3 of tax revenue disaggregation, which encompasses taxes on income, profits and capital gains, payroll and workforce, on property, goods and services, international trade and transactions, and other taxes. We exclude social contributions and grants, as they do not meet the definition of a tax.[9] Taxes are expressed in percent of GDP, and are regrouped in two blocks: (i) direct taxes, which include taxes on income, profits, property, and on capital gains for both individuals and corporations, and (ii) indirect taxes, consisting of taxes on goods and services, taxes on international trade and transactions, and other taxes.[10]

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[7] Despite these differences across databanks, their associated data are highly correlated: the correlation coefficient of total tax revenue between the GFS and the WEO is 0.92, and 0.93 between the GFS and the ICTD.

[8] GFSM 2014, pp. 88.

[9] Social contributions are actual or imputed revenue receivable by social insurance schemes to make provision for social insurance benefits payable, while grants are transfers receivable by government units, from other resident or nonresident government units or international organizations (GFSM, 2014).

[10] Full definition of each category of tax can be found in the Government Finance Statistics Manual (2014).

Table 1. Classification of Tax Revenues

11	Taxes
111	Taxes on income, profits, and capital gains
1111	Payable by individuals
1112	Payable by corporations and other enterprises
1113	Other taxes on income, profits, and capital gains
112	Taxes on payroll and workforce
113	Taxes on property
1131	Recurrent taxes on immovable property
1132	Recurrent taxes on net wealth
1133	Estate, inheritance, and gift taxes
1135	Capital levies
1136	Other recurrent taxes on property
114	Taxes on goods and services
1141	General taxes on goods and services
11411	Value-added taxes
11412	Sales taxes
11413	Turnover and other general taxes on goods and services
11414	Taxes on financial and capital transactions
1142	Excise
1143	Profits of fiscal monopolies
1144	Taxes on specific services
1145	Taxes on use of goods and on permission to use goods or perform activities
11451	Motor vehicle taxes
11452	Other taxes on use of goods and on permission to use goods or perform activities
1146	Other taxes on goods and services
115	Taxes on international trade and transactions
1151	Customs and other import duties
1152	Taxes on exports
1153	Profits of export or import monopolies
1154	Exchange profits
1155	Exchange taxes
1156	Other taxes on international trade and transactions
116	Other taxes
1161	Payable solely by business
1162	Payable by other than business or unidentifiable

Source: GFSM 2014

2.3. Dealing with missing data

We fill missing observations in the GFS using available data from the IMF's Worldwide Revenue Database. We take great care at ensuring consistency between these data and our baseline dataset (GFS). To this end, we first check whether the historical data available in both databases match. Then, we make sure that filling the missing data does not lead to inconsistencies in the resulting database. Particularly, we refrain from filling a gap when this is likely to result in a substantial discrepancy between the total tax figure and the sum of the sub-components. Annex 3 provides an overview of the missing observations that were filled with data from the IMF's Worldwide Revenue Database.

2.4. Composition of tax revenues

Figure 1 below provides a snapshot of the different tax categories, along with their relative share during 2000-15 (full sample average values). Indirect taxes (notably taxes on goods and services) stand as the largest tax component, accounting for about 60 percent of total taxes, against 40 percent for direct taxes. This pattern reflects the growing reliance on tax on goods and services over the past two decades (160 countries are currently using some forms of VAT), most likely owing to its relative ease of administration and its economic neutrality.[11]

[11] The VAT was first introduced in France in 1954.

Figure 1. Composition of Tax Revenues, 2000-15

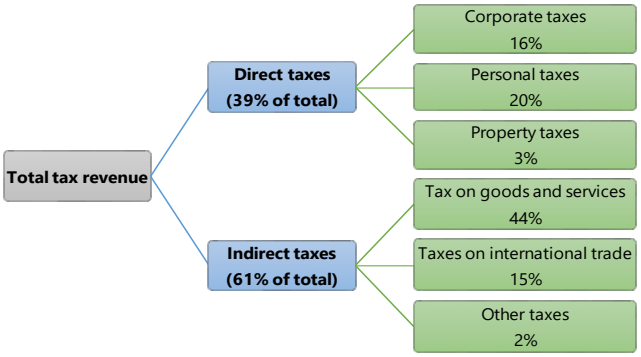

Table 2 provides more detailed trends on tax revenue and its associated components. Not surprisingly, on average, tax revenue is higher in AEs (25 percent of GDP), more than twice the level in developing countries. Non-resource-rich countries and non-fragile states mobilize larger tax revenue (20.2 and 19.7 percent of GDP, respectively) compared to their resource-rich and fragile peers (11.6 and 14.8 percent of GDP, respectively).[12] Surprisingly, small states mobilize greater tax revenue than their non-small peers (20.4 and 18.8 percent, respectively). This could be explained by a "*size effect*", in that smaller states tend to be easier to administer, from a tax collection and administration standpoint.

Table 2. Descriptive Statistics of Tax Revenues

Percent of GDP

	Total taxes	Corporate tax	Personal tax	Property tax	Tax on goods & services	Tax on international trade	Other taxes
Full sample	19.0	2.9	4.3	0.5	8.5	2.5	0.3
By income level							
High income: OECD	25.8	3.1	9.3	1.3	11.6	0.1	0.3
High income: non-OECD	15.6	2.5	2.5	0.4	7.3	2.3	0.4
Upper middle income	19.4	3.7	2.5	0.3	8.7	3.7	0.3
Lower middle income	16.8	2.9	2.3	0.2	7.2	3.4	0.4
Low income	11.2	1.6	1.4	0.0	5.5	2.5	0.2
By region							
EU	25.3	2.7	9.0	1.0	12.3	0.1	0.3
Non-EU and CA	21.0	2.7	4.8	0.5	10.2	2.3	0.2
NA	19.1	2.7	3.2	10.8	2.1	0.2	0.0
EAP	19.2	2.8	4.4	0.8	8.6	1.5	0.4
LAC	16.9	2.4	1.9	0.4	7.5	4.1	0.3
MENA: Non-GCC	18.9	4.7	2.8	0.3	8.5	1.6	0.8
MENA: GCC	5.8	2.9	0.2	0.0	1.8	0.9	0.0
SA	10.6	2.2	0.8	0.0	4.7	2.7	0.2
SSA	18.2	3.6	2.4	0.1	6.1	5.8	0.3
By size							
Small states	20.4	3.0	3.5	0.3	7.3	6.1	0.3
Non-small states	18.8	2.9	4.5	0.6	8.9	1.3	0.3
Fragility status							
Fragile states	11.6	1.8	1.9	0.3	4.4	3.2	0.6
Non-fragile states	19.7	3.0	4.4	0.5	8.8	2.4	0.3
Natural resource endowment							
Resource rich countries	14.9	5.2	1.8	0.2	5.4	1.6	0.5
Non-resource rich countries	20.2	2.6	4.8	0.6	9.2	2.5	0.3

Source: GFS, and authors' calculations

[12] The low level of tax revenue in non-OECD high income countries owes much to the fact these are mostly oil-exporting countries.

III. CONSTRUCTION OF THE RDI

3.1. Methodological Approach

Our RDI is based on the Theil index approach. The Theil's entropy index (Theil, 1972) is preferred to the HHI (Hirschman, 1964), as it features more appealing properties, notably in terms of stability and robustness to outliers. The Theil index has been proven to be more stable regardless of the level of disaggregation, given it incorporates the *within* and *between* components, and is more adapted to grouped data (World Bank, 2014). For instance, in exports diversification analysis, the Theil index can be computed along export lines and split up additively into between-groups and within-groups components (Cadot et al.,2011). In addition, for income distribution analysis, the Theil index allows decomposing inequality into the part that is due to inequality within areas (e.g. urban, rural) and the part that is due to differences between areas (e.g. the rural-urban income gap). The main drawback of the HHI relates to its instability and sensitivity to the level of disaggregation, as it assigns greater weight to the larger categories. In addition, the HHI underestimates the values of small categories, as it uses the square terms, which can be quite problematic for analyzing tax revenue patterns, as any percentage point of additional revenue can make a significant difference in thousands of people's lives.[13] The These appealing properties of the Theil index go a long way to explaining its growing popularity in recent studies, including on exports diversification (e.g. Cadot and others, 2011; Papageorgiou and Spatafora, 2012).

We use the Theil index formula to calculate the RDI, as follows:

$$T = \frac{1}{n}\sum_{i=1}^{n}\frac{Tax_i}{\mu} \times log\left(\frac{Tax_i}{\mu}\right) \quad (1)$$

T refers to the Theil index; Tax_i to a specific direct or indirect tax subcomponent (corporate income tax, personal income tax, or taxes on goods and services), and $\mu = \frac{1}{n}\sum_{i=1}^{n} tax_i$ is the average of the tax subcomponent into consideration. T is a measure of concentration, with a higher value of *T* referring to a more concentrated structure of tax sources, or a lower diversification of tax revenue. Given the construction of the RDI rests on six categories of taxes, the resulting Theil index will vary between 0 (perfect diversification) and 1.8 (reliance on one type of tax only).[14]

3.2. Results

3.2.1. Stylized Facts

We highlight key patterns standing out of the RDI. As discussed above, the higher the RDI, the stronger the concentration structure of tax sources. The full sample average RDI stands at 0.51 (Figure 3). Japan records the lowest RDI (0.05), while the Kingdom of Bahrain records the highest RDI (1.39), thus standing as the country with the most and least diversified structure of tax sources, respectively.

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[13] For robustness purposes, we compute an HHI-based RDI (see Annex 6), which turns out highly correlated with the Theil-based (correlation coefficient of 0.98). For a comprehensive review of possible approaches for computing concentration indexes, see Roberts (2014).

[14] The maximum value of the Theil index is *ln (n)*, with *n* referring to the number of considered tax categories.

Table 3 provides an RDI-based country ranking over the period 2000-15. The top 5 countries with the most diversified structure of tax sources belong to the AEs and EMEs, while the bottom 5 countries are either commodity-dependent or fragile/small countries. Over the most recent period (2010-15), Japan emerges as the top performer in terms of tax revenue diversification (RDI of 0.06), followed by France and the United Kingdom (RDI of 0.15 and 0.17, respectively). Bolivia, Kuwait, and Anguilla display the least diversified structure of tax sources (RDI of 1.34, 1.34 and 1.32, respectively). These least diversified economies tend to rely mostly on taxes on goods and services, and international trade.

Table 3. Table 3. An excerpt of RDI-based Country Ranking[15]

2000-2004			2005-2009			2010-2015		
Rank	Country	RDI	Rank	Country	RDI	Rank	Country	RDI
1	Japan	0.053	1	Japan	0.055	1	Japan	0.057
2	France	0.160	2	United Kingdom	0.140	2	France	0.153
3	United Kingdom	0.167	3	France	0.149	3	United Kingdom	0.172
4	United States	0.188	4	United States	0.156	4	United States	0.176
5	South Africa	0.192	5	Switzerland	0.182	5	South Africa	0.178
...	...	...	...	...	...	...	...	...
95	Bolivia	1.040	113	Maldives	1.141	120	Bahrain, Kingdom of	1.169
96	Bahamas, The	1.203	114	Bahamas, The	1.162	121	United Arab Emirates	1.218
97	Maldives	1.213	115	Qatar	1.173	122	Anguilla	1.317
98	Qatar	1.215	116	Anguilla	1.350	213	Kuwait	1.336
99	Anguilla	1.340	117	Burkina Faso	1.350	124	Bolivia	1.336

Source: Authors' calculations.

3.2.2. Geographical distribution of RDI

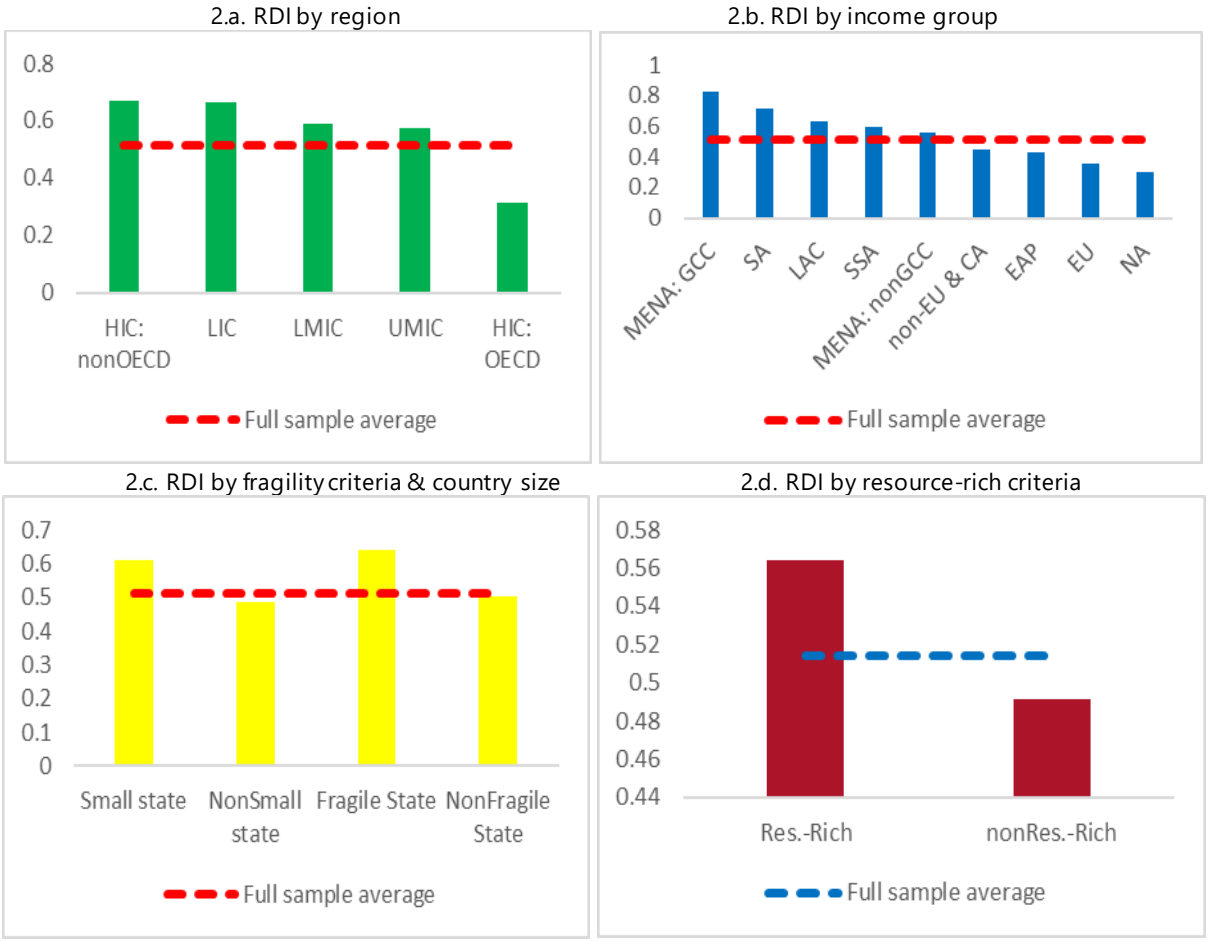
Significant differences emerge across regions (Figure 3.b). NA and EU exhibit the lowest RDI (below the full sample average), while the GCC, LAC and SSA record the highest RDI. This points to lower tax revenue diversification in these latter compared to the former groups.

The RDI also varies by income levels. Figure 3.a shows that OECD countries have the most diversified structure of tax sources, followed by middle income countries. High-income non-OECD and low-income countries record the highest RDI, meaning that they have the most concentrated structure of tax sources. Overall, tax revenue diversification appears positively correlated with countries' level of development, as confirmed by Figure 4, which shows that the concentration of tax revenue decreases as per capita GDP increases.

Fragile countries, small states, and resource-rich countries feature more concentrated structure of tax sources. This may stem from the fact that fragile countries face structural impediments, including conflicts, which makes it harder to effectively administer diverse tax revenue streams (Figure 3.c). Small States tend to specialize on a few economic activities, thus limiting their ability to diversify their sources of tax revenue (Figure 3.c). Small and fragile countries mostly rely on taxes on international trade as major source of government revenue (see Table 2). Finally, resource-rich countries have RDI standing above the full sample average, and higher than their non-natural resource rich peers (Figure 3.d). This implies that resources-dependent countries have more concentrated portfolios of tax revenue streams, owing, among other factors, to weak incentives to diversify away from the resource bonanza. Tax revenue in these countries mostly comes from corporate income taxes from the resource exploitation.

[15] The full RDI-based country ranking can be found in Annex 4.

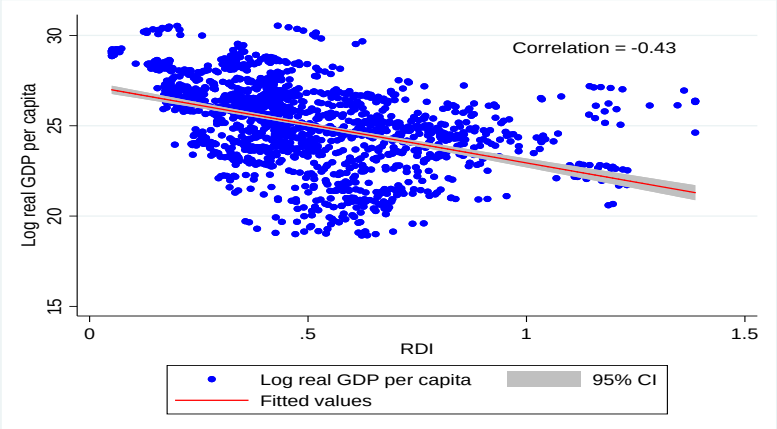
Figure 2. Figure 2. RDI by Region, Income Group, Fragility Status and Size (Average Values)



Source: Authors' calculations

Note: SA stands for South Asia, LAC for Latin America and Caribbean, SSA for sub-Saharan Africa, MENA for Middle East and North Africa, EU for European Union, NA for North America, CA for Central Asia; GCC for Golf Cooperation Council. HIC stands for high income country, LIC for low income country, LMIC for lower middle-income country, UMIC for upper middle-income country, and OECD for Organization for Economic Cooperation and Development.

Figure 3. Correlation Between Per Capita GDP and RDI

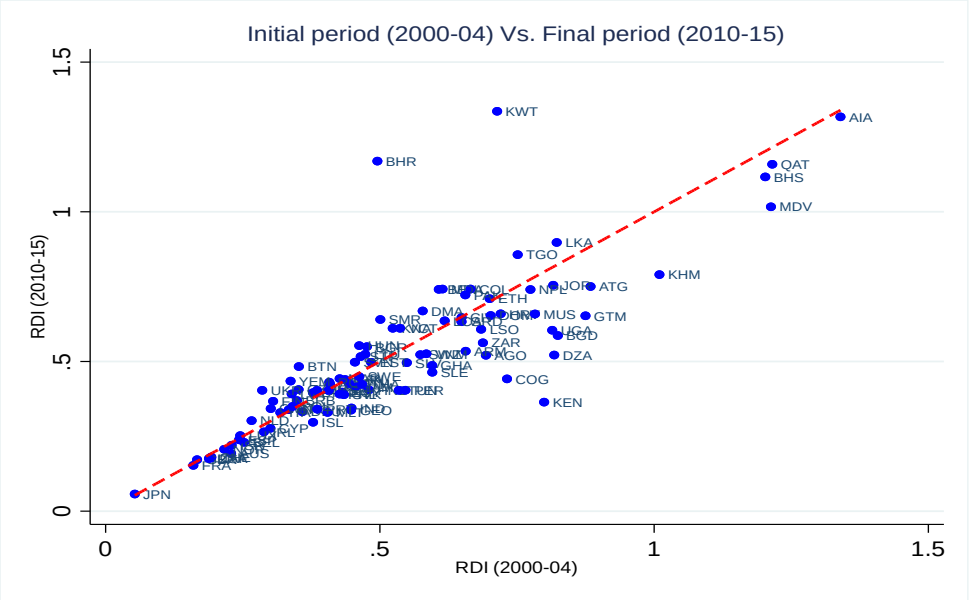


Sources: WEO and authors' calculations

3.2.3. RDI Over Time

Figure 5 plots the evolution of the RDI between the initial (2000-2004) and final period (2010-2015). While some countries diversified their structure of tax sources over time, particularly AEs and some EMEs (Austria, Denmark, France, Germany, Japan, Morocco and South Africa), others displayed a more concentrated structure of tax sources in recent years (Kuwait, Bahrain and Sri Lanka). Another set of countries experienced mixed diversification patterns. While their RDI remains below the sample average, it shrunk over time (Bhutan, Dominica, Estonia, Finland, Netherlands). Finally, some countries diversified their taxation sources (Algeria, Côte d'Ivoire, Ghana, Kenya, Mauritius and Uganda).

Figure 4. RDI Over Time



3.3. Putting the RDI in Perspective with Macroeconomic Developments

We provide preliminary correlations between the RDI and key macroeconomic variables, such as total tax revenue and its volatility, spending volatility, growth volatility, income inequality and exports concentration (Figure 6).[16] The following patterns stand out:

- Concentrated structure of tax sources is associated with both lower tax revenue (Figure 6.a) and greater volatility – tax revenue, growth, and spending (Figure 6.b, 6.c, and 6.d, respectively). This seems in line with the intuitive view that a more diversified portfolio of tax revenue streams helps strengthen fiscal resilience to government revenue volatility.

- The RDI is correlated with export diversification (Figure 6.f), which also proxies for the level of economic diversification. This may stem from the fact that various taxes from export-related

[16] Volatility is captured through the standard deviation of each variable.

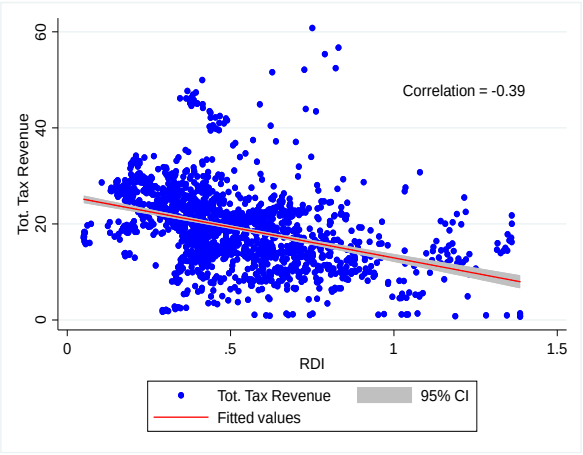
activities, including from the mining sector, accounts for a big chunk of government revenue in many countries, particularly in LIDCs (Table 2).

- Concentrated tax revenue is correlated with income inequality (Figure 6.e). A possible explanation is that the more concentrated the tax sources structure, the more likely its incidence gets unequally distributed within the population. This may also suggest that in countries with weak institutions, corrupt leaders may impose highly unequal redistribution of wealth, which in turn translates into more concentrated tax sources structure.

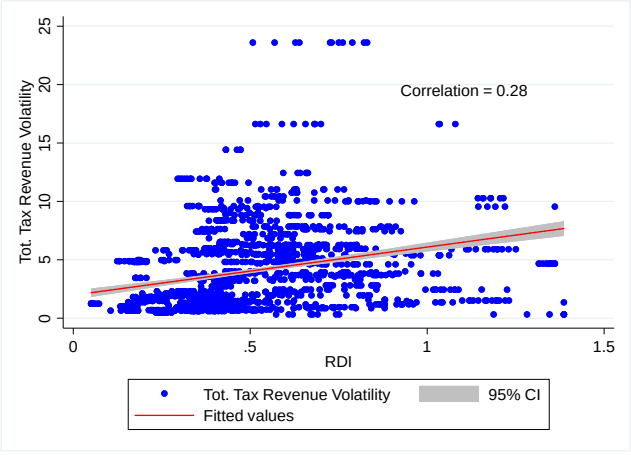
- Tax revenue concentration is negatively associated with tax collection efficiency (Figure 6.h) and taxpayer's compliance (Figure 6.g), suggesting that the diversification of tax sources and the capacity to administer tax compliance might be mutually-reinforcing.

Figure 5. Correlation Between the RDI and Key Macroeconomic Variables, 2000-15

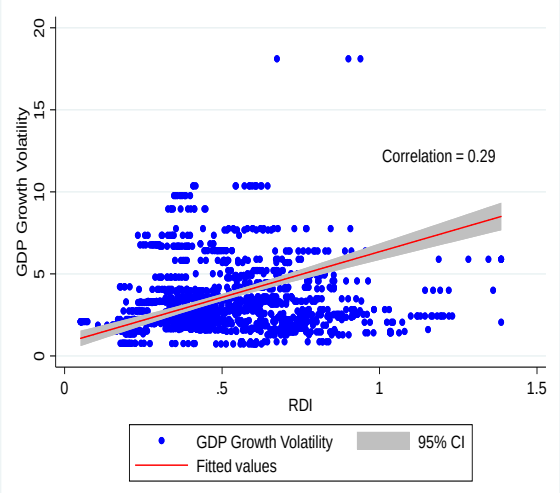
5.a. RDI and Tax Revenue



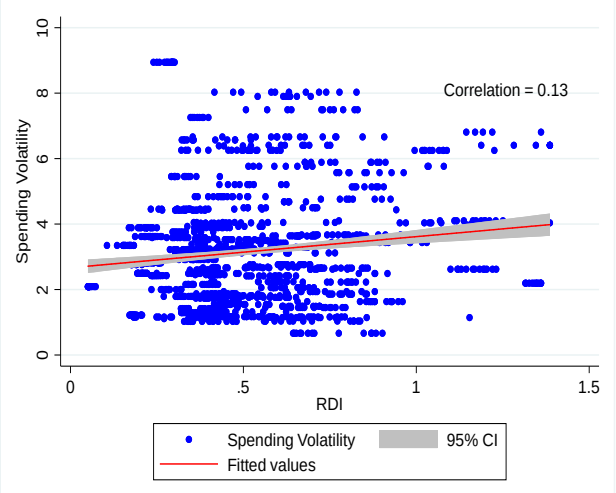
5.b. RDI and Tax Revenue Volatility



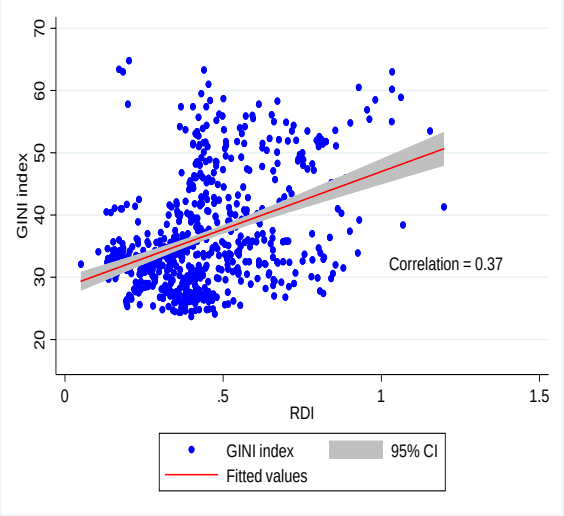
5.c. RDI and GDP Growth Volatility



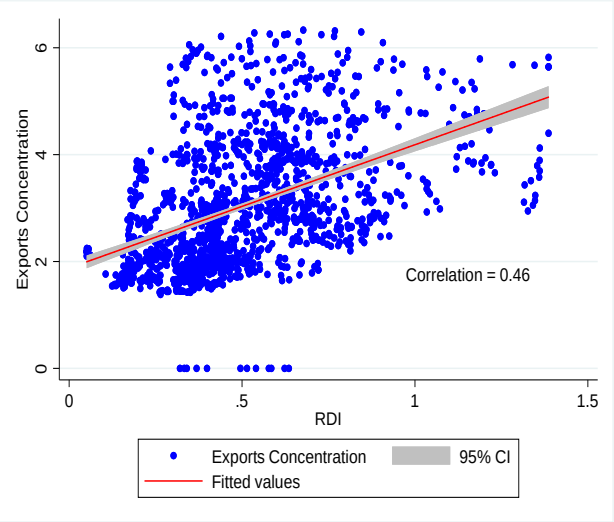
5.d. RDI and Spending Volatility



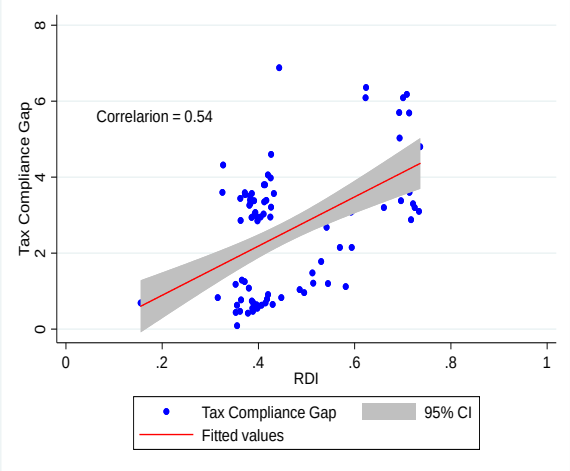
5.e. RDI and Income Inequality



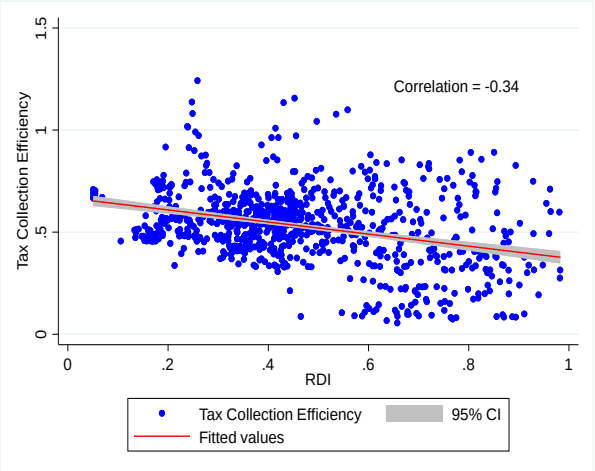
5.f. RDI and Export Concentration



5.g. RDI and Tax Compliance Gap



5.h. RDI and Tax Collection Efficiency



Sources: Authors' calculations

IV. Drivers of Tax Revenue Diversification: An Econometric Analysis

We turn now onto assessing the key drivers of cross-country variations in the RDI. We carry out panel regressions linking the RDI to potential explanatory variables, using the full sample over the period 2000-15. The following econometric specification is considered.

$$RDI_{it} = \alpha + \beta RDI_{i,t-1} + \gamma X_{i,t-1} + \lambda K_{i,t-1} + \sum_{k=1}^{K} \varphi_k Z_{k,i,t-1} + \eta_i + \varepsilon_{it} \qquad (2)$$

Revenue diversification index (RDI) is the dependent variable, and three sets of potential covariates are considered: (i) factors capturing the country economic structure (X_{it}); (ii) variables reflecting the macroeconomic (domestic and external) environment (K_{it}); and (iii) factors featuring countries' political and institutional context along with their development status ($Z_{k,it}$).[17] We run dynamic panel regressions using system-GMM estimators, to better address likely endogeneity problems while accounting for the persistency in the RDI over time. All covariates are introduced with

[17] Detailed definitions and sources of all variables can be found in Annex 2.

one-year lag, to account for likely delays in the influence of these variables on the RDI, and to mitigate likely reverse causality bias.

Table 4 reports the estimates of the RDI drivers, focusing first on the role of the structure of the economy and the macroeconomic environment.[18] Before going any further, it is worth signaling that the RDI exhibits high persistency over time, as captured by the strongly significant coefficient associated with the lagged RDI variable. Up to 60-74 percent of the current level of tax diversification is predicted by its lagged value, suggesting a strong inertia in the RDI dynamics.

Countries' level of development (proxied by per capita real GDP) has a significant non-linear impact on their ability to diversify their tax revenue sources. There is a significant inverted U-shaped relationship between per capita real GDP and the RDI. The coefficient associated with per capita real GDP is negative, while the coefficient associated with its squared term is positive. This suggests that countries' level of tax revenue diversification tends to increase as their economy develops, insofar as they strengthen their institutional framework and improve tax administration capacity, until they reach a tipping point beyond which further diversification of tax revenue becomes harder.[19] This somehow reflects the specialization on a few high skills-based economic activities that characterize some AE's growth model (e.g., shifting to an innovation-based growth model).

The structure of the economy matters for shaping a country's tax revenue diversification. First, a less diversified economy, proxied by the export concentration index, is conducive to a more concentrated structure of tax revenue. Columns 2-9 show that higher export concentration goes hand-in-hand with higher tax revenue concentration, as reflected by the positive and significant coefficient associated with the export concentration index. Second, there is also suggestive evidence of some form of "natural resources curse" being at play, as captured by the positive and statistically significant coefficient associated with natural resource rents (column 3). This suggests that countries with larger natural resource endowments face less incentives to diversify their structure of taxation sources. Indeed, most resources-rich countries tend to over-rely on the resource bonanza –the GCC countries for example introduced the VAT for the first time in 2018, amid the recent oil price shocks. Third, the coefficient associated with per capita official development assistance is positive and statistically significant (column 4). This suggests stronger dependency to donor support weakens policymakers' incentives to diversify taxation sources, bringing to the data long-held views about moral hazard in domestic revenue mobilization in contexts of dependency to public aid, notably unconditional grants (Thornton, 2014). Fourth, a larger informal sector makes it harder to identify taxpayers and assess their compliance, thus rendering more arduous any steps to bring taxpayers into the tax net (column 5).

[18] The regressions passed the standard diagnostic tests for the validity of instruments – the AR(2) test for the absence of second-order autocorrelation of the error term and Hansen's overidentification test.

[19] The average per capita GDP threshold level is $ 4222, corresponding broadly to the current levels recorded by countries such as Georgia.

Table 4. Macroeconomic and Structural Drivers of RDI, 2000-15

Dependent variable: *Revenue diversification index (RDI)*									
	Baseline estimates and additional controls								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$RDI_{(t-1)}$	0.679***	0.604***	0.599***	0.737***	0.683***	0.598***	0.608***	0.619***	0.610***
	(0.061)	(0.019)	(0.018)	(0.030)	(0.029)	(0.015)	(0.019)	(0.018)	(0.011)
Log real $GDP\_pc_{(t-1)}$	-0.460*	-0.395***	-0.450***	-0.274*	-0.539**	-0.533***	-0.336**	-0.308**	-0.786***
	(0.255)	(0.144)	(0.143)	(0.165)	(0.249)	(0.133)	(0.137)	(0.148)	(0.080)
Log real $GDP\_pc\_squared_{(t-1)}$	0.025*	0.025***	0.028***	0.017	0.037**	0.034***	0.022**	0.021**	0.050***
	(0.014)	(0.009)	(0.009)	(0.011)	(0.016)	(0.008)	(0.009)	(0.009)	(0.005)
Financial $development_{(t-1)}$		-0.381***	-0.349**	0.079	-0.653**	-0.523***	-0.371***	-0.492***	-0.721***
		(0.139)	(0.149)	(0.166)	(0.273)	(0.143)	(0.135)	(0.158)	(0.115)
Trade $openness_{(t-1)}$		-0.026	-0.015	0.011	-0.033	-0.037	-0.022	-0.038	-0.049**
		(0.025)	(0.028)	(0.018)	(0.044)	(0.023)	(0.025)	(0.025)	(0.021)
Export concentration $index_{(t-1)}$		0.018**	0.013*	0.008	0.007	0.012	0.015*	0.023*	0.014*
		(0.009)	(0.008)	(0.005)	(0.023)	(0.009)	(0.008)	(0.013)	(0.008)
Natural resource $rents_{(t-1)}$			0.272**						
			(0.125)						
Log net ODA $received\_pc_{(t-1)}$				0.011**					
				(0.005)					
Log of informal $share_{(t-1)}$					0.137*				
					(0.080)				
Log of inflation $rate_{(t-1)}$						0.010*			
						(0.005)			
De jure globalization $index_{(t-1)}$							-0.018		
							(0.061)		
Human capital $index_{(t-1)}$								-0.037	
								(0.036)	
IMF program dummy									-0.017*
									(0.009)
Constant	2.163*	1.734***	1.965***	1.106*	1.742*	2.335***	1.572**	1.441**	3.387***
	(1.111)	(0.594)	(0.594)	(0.641)	(0.911)	(0.553)	(0.614)	(0.613)	(0.351)
Nb. of observations	1218	1141	1141	639	943	1061	1141	960	1125
Countries	104	97	97	65	83	95	97	79	94
AR(1)	0.06	0.09	0.09	0.00	0.08	0.10	0.09	0.09	0.09
AR(2) *p-value*	0.31	0.30	0.30	0.20	0.27	0.28	0.30	0.31	0.30
Hansen OID (*p-value)*	0.58	0.15	0.15	0.71	0.88	0.37	0.17	0.34	0.16
Nb. of instruments	29	58	59	53	48	61	59	59	72
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

*, **, and *** denote statistical significance at 10 percent, 5 percent and 1 percent level, respectively. Standard errors are reported in brackets.
Note: Our measure of revenue diversification (RDI) is considered endogenous, along with the GDP per capita, its squared term, and the financial development variables. These endogenous variables are instrumented using their own respective lags. We follow Roodman (2009) and collapse the number of instruments to avoid the overidentification problem. In all specifications, we reject the null of the AR (1) test of no autocorrelation in the error terms. Thus, lagged variables can be safely used as instruments. Hansen's p-value robust to heteroskedasticity and autocorrelation validates the over-identification restrictions. The remaining variables are considered exogeneous.

Macroeconomic conditions play a role in countries' tax revenue diversification patterns.[20] First, larger trade openness is positively correlated with greater with tax revenue diversification. The coefficients associated with trade openness (columns 2-9) are negative, though statistically insignificant in most cases. Second, greater macroeconomic instability (proxied by inflation) is also found to be associated with lower tax diversification (column 6). This may point to the macroeconomic uncertainties brought about by greater instability, which ultimately results in the instability of the tax revenue, and likely its shrinkage. Third, the coefficient associated with financial development is significantly negative (columns 2 to 9). This suggests that deeper financial systems may allow for

[20] The statistical significance of the coefficients associated with the degree of globalization and human capital (columns 7-8) is weak.

greater formalization of the economy, which in turn makes it easier to broaden the portfolio of tax revenue streams (Medina and others, 2017). Fourth, having an IMF-supported program may also help diversify the structure of tax sources. This may reflect countries' efforts to improve revenue collection performance under IMF-supported programs (column 9).

There are significant heterogeneities across income levels and regions (Table 5). Compared with AEs, LIDCs and EMEs have more room to diversify further their portfolio of tax revenue streams (column 2), insofar as they strengthen their institutional framework and improve their tax administration capacity (Gaspar and others, 2016; and Akanbi and Akitoby, 2018). Column 1 confirms the regional disparities in RDI, with South Asia, Latin America, and the Middle east and North Africa displaying the least diversified structure of tax sources. Resource-rich countries also exhibit less diversified structure of tax revenue sources compared to other countries (column 3).

Table 5. Macroeconomic and Structural Drivers of RDI, by region and income level

Dependent variable: *Revenue diversification index (RDI)*			
	Baseline	Advanced vs EME/LIDC	Resource rich
	(1)	(2)	(3)
$RDI_{(-1)}$	**0.611*** **	**0.784*** **	**0.597*** **
	(0.011)	(0.077)	(0.019)
RDI × AEs $Dummy_{(-1)}$		**-0.172***	
		(0.096)	
AEs $Dummy_{(-1)}$		0.014	
		(0.091)	
Real $GDP\_pc_{(-1)}$	-0.617***	-0.534	-0.407***
	(0.080)	(0.342)	(0.146)
Real $GDP\_pc\_squared_{(-1)}$	0.038***	0.032	0.026***
	(0.005)	(0.021)	(0.009)
Financial $development_{(-1)}$	-0.396***	0.003	-0.357**
	(0.108)	(0.238)	(0.149)
Trade $openness_{(-1)}$	-0.032*	-0.034	-0.012
	(0.019)	(0.042)	(0.027)
Export concentration $index_{(-1)}$	0.025***	0.043***	-0.004
	(0.007)	(0.015)	(0.021)
Dummy_EAP	0.027		
	(0.041)		
Dummy_LAC	0.081***		
	(0.031)		
Dummy_MENA	0.240***		
	(0.047)		
Dummy_SA	0.140***		
	(0.039)		
Dummy_SSA	-0.002		
	(0.033)		
Resource rich (RR) dummy			0.095**
			(0.043)
Constant	2.631***	2.195	1.822***
	(0.346)	(1.360)	(0.601)
Nb. Obs.	1141	1141	1141
Countries	97	97	97
AR(1)	0.08	0.07	0.09
AR(2)	0.30	0.31	0.29
Hansen	0.07	0.71	0.17
Nb. Instr.	70	35	58
Year FE	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*No*	*Yes*

*, **, and *** denote statistical significance at 10 percent, 5 percent and 1 percent level, respectively. Standard errors are reported in brackets.
Note: Same as in table 4.

Table 6. Political and Institutional Drivers of RDI, 2000-15

Dependent variable: *Revenue diversification index (RDI)*

	Political and institutional factors									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$RDI_{(t-1)}$	0.610***	0.627***	0.605***	0.624***	0.598***	0.593***	0.597***	0.599***	0.580***	0.643***
	(0.019)	(0.011)	(0.012)	(0.008)	(0.010)	(0.010)	(0.015)	(0.012)	(0.018)	(0.015)
Log real GDP_pc$_{(t-1)}$	-0.606***	-0.701***	-0.779***	-0.968***	-0.721***	-1.062***	-0.324*	-0.550***	-0.432**	-0.490**
	(0.156)	(0.117)	(0.086)	(0.079)	(0.082)	(0.099)	(0.179)	(0.114)	(0.184)	(0.198)
Log real GDP_pc_squared$_{(t-1)}$	0.040***	0.044***	0.050***	0.062***	0.046***	0.071***	0.022*	0.036***	0.029**	0.034***
	(0.010)	(0.007)	(0.006)	(0.005)	(0.005)	(0.006)	(0.011)	(0.007)	(0.012)	(0.012)
Financial development$_{(t-1)}$	-0.729***	-0.521***	-0.668***	-0.687***	-0.614***	-0.719***	-0.195	-0.363***	-0.183	-0.504***
	(0.156)	(0.132)	(0.136)	(0.088)	(0.120)	(0.093)	(0.126)	(0.100)	(0.129)	(0.152)
Trade openness$_{(t-1)}$	-0.071**	0.01	-0.051*	-0.048**	-0.061**	-0.034	0.009	-0.01	-0.007	-0.049
	(0.035)	(0.031)	(0.029)	(0.023)	(0.025)	(0.027)	(0.026)	(0.021)	(0.029)	(0.030)
Export concentration index$_{(t-1)}$	0.003	0.01	0.015*	0.01	0.009	-0.005	0.016*	0.017**	0.019**	0.008
	(0.011)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.008)	(0.009)	(0.013)
Democracy$_{(t-1)}$	-0.005*									
	(0.003)									
Political polarization$_{(t-1)}$		-0.026**								
		(0.012)								
Government fractionalization$_{(t-1)}$			-0.149***							
			(0.025)							
Political stability$_{(t-1)}$				-0.003**						
				(0.001)						
Largest gov. party orient.$_{(t-1)}$					-0.011***					
					(0.004)					
Quality of bureaucracy$_{(t-1)}$						-0.150***				
						(0.019)				
Rule of law$_{(t-1)}$							-0.047*			
							(0.027)			
Government effectiveness$_{(t-1)}$								-0.062***		
								(0.020)		
Voice and accountability$_{(t-1)}$									-0.104***	
									(0.022)	
Control of corruption$_{(t-1)}$										-0.027***
										(0.010)
Constant	2.674***	2.978***	3.350***	4.359***	3.092***	4.542***	1.302*	2.253***	1.743**	2.089**
	(0.670)	(0.506)	(0.363)	(0.379)	(0.356)	(0.455)	(0.707)	(0.463)	(0.747)	(0.859)
Nb. of observations	970	909	1025	911	1015	911	1082	1082	1082	911
Countries	81	86	90	73	88	73	97	97	97	73
AR(1)	0.1	0.09	0.09	0.09	0.09	0.1	0.09	0.09	0.09	0.09
AR(2) *p-value*	0.28	0.37	0.32	0.3	0.3	0.3	0.27	0.28	0.26	0.3
Hansen OID (*p-value)*	0.42	0.19	0.2	0.22	0.24	0.29	0.13	0.1	0.24	0.48
Nb. of instruments	60	71	71	71	71	71	60	70	59	59
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

*, **, and *** denote statistical significance at 10 percent, 5 percent and 1 percent level, respectively. Standard errors are reported in brackets.
Note: Same as in table 4.

Political and institutional factors are also at play (Table 6). First, deeper democracy seems to foster tax revenue diversification. The coefficient associated with the degree of democracy (the Polity 2 index), is negative and significant (column 1). This finding may reflect that stronger democracy, including through greater checks and balances, strengthens the "sincerity" of the social contract between the government and taxpayers, thereby increasing the latter's willingness to pay taxes in exchange for improved quality of public services. Second, polarized political systems (captured either through the government fractionalization or political polarization index, columns 2-3) and stronger political stability (column 4) are conducive to greater diversification of tax revenue. Indeed, a polarized political system may lead to a more diversified portfolio of revenue streams, in that politicians in these contexts have less room to manipulate the tax system disproportionately in favor of given constituencies, thus ending up sharing the tax burden more equally across all segments of the population and of economic activities, consistently with the *common pool* problem (Alesina and Perotti, 1995). Stronger political stability makes it easier for the government to focus on implementing its declared policies, including strengthening

resilience to revenue volatility through diversifying the taxation sources, instead of embarking on rent-seeking activities. Third, more socialist-oriented governments are more prone to diversifying the taxation sources across all segments of the population and economic activities, as reflected by the negative coefficient associated with the largest government party's orientation (column 5).[21] Fourth, institutional quality, as captured by the quality of bureaucracy (column 6), the rule of law (column 7), government effectiveness (column 8), and government accountability (column 9), strengthens policymakers' ability to diversify tax revenue streams. The coefficients associated with these variables are negative and significant, suggesting that countries with strong institutions have greater capacity to administer compliance on diverse tax instruments. Similarly, stronger control of corruption helps diversify taxation sources (columns 10), as less corruption allows for better tax administration and reduced leakages in tax revenue, hence for greater tax compliance.

V. IMPACTS OF TAX REVENUE DIVERSIFICATION

This section investigates the potential benefits associated with the diversification of tax revenue sources. We rely on the econometric specification below to assess the influence of the RDI on both tax revenue collection and its volatility.

$$Y_{it} = \alpha + \beta Y_{i,t-1} + \gamma RDI_{it-1} + \sum_{k=1}^{K} \varphi_k Z_{k,it-1} + \eta_i + \pi_t + \varepsilon_{it} \quad (3)$$

RDI_{it}, which stands for tax revenue diversification, is the explanatory variable of interest. We focus on two outcome variables (Y_{it}). On the one hand, we investigate the impact of tax revenue diversification on revenue collection performance, as captured by the tax-to-GDP ratio. On the other hand, we assess the effect of revenue diversification on the volatility of tax revenue.[22] Subscripts *i* and *t* denote the country and time dimensions, respectively. We follow the existing literature and include a set of variables $Z_{k,it}$ in both specifications to isolate the effects of factors that influence revenue collection performances (per capita GDP, trade openness, informality, share of agricultural Value added, natural resource rents, social conflicts and political unrests, the exchange rate, public debt, FDI, institutional quality and the degree of democracy) and the volatility of tax revenue (GDP per capita, growth volatility, trade openness, natural resource rents, financial development, economic diversification, political stability and polarization, institutional quality, and the presence of fiscal rules), other than the RDI. η_i captures the country-specific and time-invariant effects, and ε_{it} is the error term. Time dummies are also included in our specifications to control for common shocks affecting our left-hand-side variables. Equations (3) and (5) are estimated using the GMM estimators.

We uncover suggestive evidence that greater tax revenue diversification improves non-oil revenue collection (Table 7).[23] A higher RDI score, which reflects a high level of tax revenue concentration, is associated with lower tax revenue. In other terms, diversifying the portfolio of tax

[21] Largest Government Party orientation with respect to economic policy is coded as follows: (i) Right, if the party is defined as conservative, Christian democratic, or right-wing, and assigned a value of 1; (ii) Center, if the party is defined as centrist or when the party position can best be described as centrist, and assigned a value of 2; (iii) Left if the party is defined as communist, socialist, social democratic, or left-wing, and assigned a value of 3; (iv) the variable equals zero if no information is available (Database on Political Institutions, 2015).

[22] Volatility of tax revenue is measured as the standard deviation over a 3-year rolling window.

[23] The regressions passed the standard diagnostic tests for the validity of instruments – the AR(2) test for the absence of second-order autocorrelation of the error term and Hansen's overidentification test.

revenue streams improves revenue collection. In terms of magnitude, the results suggest that a 10 percent increase in the RDI score can yield additional tax revenue of up to 0.2-0.4 percentage points of GDP.

Table 7. Effects of RDI on tax revenue mobilization

Dependent variable: *Tax revenue (in % GDP)*												
	Baseline and additional controls					Additional controls					Political and institutional controls	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Tax revenue$_{(-1)}$	0.866***	0.933***	0.925***	0.929***	0.928***	0.966***	0.955***	0.912***	0.917***	0.929***	0.938***	0.922***
	(0.013)	(0.010)	(0.010)	(0.014)	(0.011)	(0.013)	(0.010)	(0.013)	(0.010)	(0.015)	(0.012)	(0.008)
RDI$_{(-1)}$	**-0.036*** **	**-0.025*** **	**-0.028*** **	**-0.016*** **	**-0.021*** **	**-0.017***	**-0.021*** **	**-0.028*** **	**-0.018*** **	**-0.029*** **	**-0.015***	**-0.012*** **
	(0.010)	(0.008)	(0.006)	(0.006)	(0.008)	(0.009)	(0.008)	(0.008)	(0.007)	(0.009)	(0.009)	(0.005)
Real GDP_pc$_{(-1)}$	0.177***	0.073	0.142***	0.151***	0.089*	-0.170***	-0.137***	0.173***	0.234***	0.039	-0.021	0.118***
	(0.051)	(0.050)	(0.051)	(0.044)	(0.054)	(0.042)	(0.034)	(0.052)	(0.061)	(0.049)	(0.049)	(0.043)
Real GDP_pc_squared$_{(-1)}$	-0.010***	-0.005*	-0.009***	-0.010***	-0.006*	0.008***	0.006***	-0.011***	-0.014***	-0.003	-0.001	-0.008***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Trade openness$_{(-1)}$		0.002	-0.001	-0.001	0.001	0.002	0.002	0.016*	0.001	0.003	0	-0.001
		(0.005)	(0.005)	(0.005)	(0.006)	(0.003)	(0.003)	(0.009)	(0.006)	(0.004)	(0.004)	(0.009)
Informality$_{(-1)}$			-0.038*									
			(0.023)									
Agricultural VA$_{(-1)}$				-0.018**								
				(0.008)								
Natural ress. rents$_{(-1)}$					-0.102***							
					(0.024)							
Internal conflicts$_{(-1)}$						0.004*						
						(0.002)						
Political risks$_{(-1)}$							0.001***					
							0.000					
Official ER$_{(-1)}$								0.015***				
								(0.005)				
Public Debt/GDP$_{(-1)}$									0.028***			
									(0.006)			
FDI net inflows$_{(-1)}$										0.003*		
										(0.001)		
Quality of bureaucracy$_{(-1)}$											0.040***	
											(0.007)	
Democracy$_{(-1)}$												0.002**
												(0.001)
Constant	-0.318	-0.050	-0.136	-0.264	-0.093	0.924***	0.785***	-0.457**	-0.769***	0.059	0.401**	-0.168
	(0.208)	(0.199)	(0.178)	(0.168)	(0.212)	(0.180)	(0.164)	(0.200)	(0.258)	(0.184)	(0.200)	(0.173)
Nb. Obs.	1223	1191	958	1139	1191	930	930	989	1174	1109	930	991
Countries	104	102	84	101	102	75	75	90	100	100	75	83
AR(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR(2)	0.43	0.49	0.11	0.78	0.48	0.08	0.08	0.48	0.46	0.97	0.08	0.29
Hansen	0.25	0.16	0.10	0.13	0.17	0.86	0.79	0.41	0.33	0.27	0.64	0.22
Nb. Instr.	80	81	87	96	82	84	84	84	84	84	82	83
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

*, **, and *** denote statistical significance at 10 percent, 5 percent and 1 percent level, respectively. Standard errors are reported in brackets.
Note: The RDI variable, GDP per capita and its squared term are considered endogenous, and instrumented using their own respective lags. The number of internal instruments is restricted to avoid the overfitting problem. All specifications reject the null of the AR (1. Hansen's p-value validates the over-identification restrictions across all specifications, except in column (3).

Tax revenue diversification is also found to be associated with lower tax revenue volatility (Table 8).[24] This is reflected in the positive and statistically significant coefficient associated with the RDI (tax revenue concentration), which lends support to the long-held informal view that greater reliance on a diversified portfolio of tax revenue streams mitigates significantly the volatility of government tax revenue. Put simply, there is suggestive evidence that countries with more diversified structure of tax sources are more likely to exhibit stronger resilience to revenue volatility arising from the business cycle fluctuations. In terms of magnitude, the results suggest that a one-point improvement in tax revenue diversification is associated with a reduction in tax revenue volatility of up to 0.5-2.8 points.

[24] Standard diagnostic tests for the validity of instruments are passed in most cases (except in columns 7 and 9, where the P-value associated with Hasen's overidentification test did not pass the conventional 5 percent threshold).

Table 8. Effects of RDI on tax revenue volatility

	Dependent variable: *Volatility of tax revenue*									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Revenue volatility$_{(-1)}$	0.694***	0.657***	0.502***	0.466***	0.681***	0.779***	0.756***	0.758***	0.755***	0.828***
	(0.019)	(0.009)	(0.005)	(0.025)	(0.009)	(0.016)	(0.007)	(0.005)	(0.007)	(0.015)
RDI$_{(-1)}$	**2.422*** **	**2.801*** **	**1.644*** **	**1.397** **	**2.006*** **	**0.981***	**0.487** **	**1.020*** **	**1.019*** **	**2.217*** **
	(0.636)	(0.317)	(0.243)	(0.545)	(0.233)	(0.516)	(0.229)	(0.199)	(0.239)	(0.560)
Real GDP_pc$_{(-1)}$	3.455***	2.908***	3.801***	10.047***	6.918***	4.798***	7.070***	5.070***	6.818***	13.302***
	(1.240)	(0.918)	(0.913)	(2.051)	(0.971)	(1.052)	(0.795)	(0.671)	(0.618)	(1.063)
Real GDP_pc_squared$_{(-1)}$	-0.170**	-0.139***	-0.153***	-0.564***	-0.363***	-0.270***	-0.399***	-0.287***	-0.398***	-0.613***
	(0.071)	(0.051)	(0.054)	(0.114)	(0.058)	(0.064)	(0.046)	(0.040)	(0.035)	(0.057)
Trade openness$_{(-1)}$	-2.255***	-1.610***	-0.332**	0.986**	-1.970***	0.098	0.121	0.206	0.074	-2.924***
	(0.514)	(0.311)	(0.135)	(0.432)	(0.346)	(0.241)	(0.162)	(0.151)	(0.177)	(0.428)
Growth volatility$_{(-1)}$	0.075***	0.031	-0.058	0.082	0.093**	0.030	0.028**	0.023*	0.030**	-0.005
	(0.026)	(0.048)	(0.039)	(0.065)	(0.045)	(0.019)	(0.011)	(0.013)	(0.012)	(0.034)
Natural res. rent$_{(-1)}$	0.009	0.016***	0.104***	0.086***	0.109***	0.018**	-0.016***	0.008***	-0.014***	0.094***
	(0.011)	(0.006)	(0.003)	(0.009)	(0.010)	(0.008)	(0.003)	(0.003)	(0.004)	(0.005)
Export concent.$_{(-1)}$	0.217	0.276***	-0.419***	0.046	0.689***	0.369***	0.315***	0.303***	0.368***	-0.420***
	(0.134)	(0.087)	(0.056)	(0.174)	(0.122)	(0.085)	(0.055)	(0.027)	(0.060)	(0.128)
Financial development$_{(-1)}$	0.222	0.394	-4.655***	3.401**	-0.401	6.704***	5.489***	6.029***	5.796***	-4.900**
	(1.527)	(0.933)	(0.925)	(1.654)	(0.889)	(1.457)	(0.756)	(0.558)	(0.855)	(2.146)
Polity_2$_{(-1)}$		-0.035***								
		(0.013)								
Corrup.$_{(-1)}$			0.096**							
			(0.048)							
Government stability$_{(-1)}$				-0.465***						
				(0.067)						
Polarization$_{(-1)}$					0.129*					
					(0.074)					
Voice and accountatbility$_{(-1)}$						-0.961***				
						(0.167)				
Regulatory qual.$_{(-1)}$							-0.893***			
							(0.113)			
Rule of law$_{(-1)}$								-0.607***		
								(0.122)		
Gov. effectivness$_{(-1)}$									-0.312***	
									(0.107)	
Fiscal rules$_{(-1)}$										-0.663***
										(0.215)
Nb. Obs.	1167	988	919	919	930	1108	1108	1108	1108	751
Countries	96	80	72	72	85	96	96	96	96	57
AR(1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AR(2)	0.71	0.68	0.39	0.46	0.54	0.76	0.73	0.73	0.72	0.35
Hansen	0.07	0.26	0.17	0.94	0.06	0.08	0.01	0.13	0.02	0.95
Nb. Instr.	74	88	88	100	81	75	86	102	86	77
Year FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*

*, **, and *** denote statistical significance at 10 percent, 5 percent and 1 percent level, respectively. Standard errors are reported in brackets.
Note: Same as in Table 7.

VI. CONCLUDING REMARKS

This paper proposed a new tax revenue diversification index (RDI) for a broad panel of 128 countries over the period 2000-15. To the best of our knowledge, this is the first paper to create such an index at the national level. Existing tax revenue diversification indexes were only computed at the states level for the US. In addition, our RDI builds on the Theil index, which features more appealing properties, notably in terms of stability and robustness to outliers.

Key patterns stand out of the RDI. On average, AEs relied on a more diversified structure of tax sources than EMEs and LIDCs, by as high as at least the double in terms of RDI score. Resources-rich countries and fragile states exhibit the largest tax revenue concentration, reflecting their over-dependence on commodity revenues and official development assistance, and their weak tax administration capacity, respectively. From a regional perspective, North American and EU countries record the most diversified structure of tax sources, while GCC, South Asian, Latin American, and Sub-Saharan African have the least diversified portfolio of tax revenue streams.

Empirical investigations suggest that beyond economic diversification, tax revenue diversification is shaped by macroeconomic, political and institutional conditions. On the macroeconomic front, countries' taxation sources get more diversified as their economy develops, insofar as they strengthen their institutions and improve their tax administration capacity, until a tipping point, with richer countries then finding it harder to further diversify their structure of tax sources. In addition, countries with more concentrated and informal economic structures, stronger dependency to aid, and plagued with macroeconomic instability, are more prone to relying on a concentrated portfolio of tax revenue streams. Political and institutional factors are also at play: deeper democracy makes it easier to diversify the portfolio of tax revenue streams, while greater stability and polarization of the political system are more conducive to greater tax revenue diversification.

Last but not the least, we find evidence supportive of the long-held view that tax revenue diversification matters a great deal for mitigating government revenue volatility. And it does not stop there: tax revenue diversification also improves tax revenue collection. Tax revenue diversification thus stands as a key factor for strengthening resilience to fiscal risks arising from government revenue volatility, critical for ensuring a sustainable delivery of public services throughout different phases of the business cycle. The current coronavirus pandemic adds further credence to this criticality of relying on a diversified portfolio of tax revenue streams for strengthening fiscal policy resilience to large swings to business cycle fluctuations. Future research could take the analysis further by delving into the causal links behind the empirical regularity observed in the data between per capita GDP and tax revenue diversification, along with its transmission channels. The influence of tax revenue diversification on income inequality as well as on policymakers' leeway for implementing countercyclical fiscal policies are additional interesting avenues for future research.

References

Akanbi, O. and Akitoby, B. (2018). "Institutions and Tax Capacity: Is There Any Causality?", IMF WP, *forthcoming*.

Akitoby, B., Baum, A., Hackney, C., Harrison, O., Primus, K., and Salins, V. (2018). "Tax Revenue Mobilization Episodes in Emerging Markets and Low-Income Countries: Lessons from a New Dataset", IMF WP 18/234.

Aldasoro, I. and Seiferling, M. (2014). "Vertical Fiscal Imbalances and the Accumulation of Government Debt", IMF WP 14/209.

Alesina, A.and Perotti, R. (1995). "Fiscal Expansions and Fiscal Adjustments in OECD Countries", NBER WP No. 5214 (Cambridge, Massachusetts: NBER).

Araujo, J. D., David, A. C., van Hombeeck, C., & Papageorgiou, C. (2017). "Non-FDI Capital Inflows in Low-Income Countries: Catching the Wave?" *IMF Economic Review*, *65*(2), 426–465.

Auerbach, A.J. (1985). "The Theory of Excess Burden and Optimal Taxation." In Handbook of Public Economics, vol. 1, edited by Auerbach, A. and Feldstein, M. 69–127. Amsterdam: North-Holland, 1985.

Bleaney, Y. M., Gemmel, N., and Greenaway, D. (1995). "Tax Revenue Instability, with Particular Reference to Sub-Saharan Africa", *The Journal of Development Studies*, 31, 883–902.

Budina, N.T., Kinda, T., Schaechter, A. and Weber, A. (2012). "Fiscal Rules in Response to the Crisis-Toward the 'Next-Generation' Rules: A New Dataset." IMF WP No. 12/187.

Cadot, O., Carrère, C., and Strauss-Kahn, V. (2011). "Export diversification: What's behind the hump?", *Review of Economics and Statistics*, *93*(2), 590–605.

Carroll, D. (2005). "Are State Governments Prepared for Fiscal Crises? A Look at Revenue Diversification during the 1990s", *Public Finance Review*, 33(5), 603–633.

Furceri, D. (2007). "Is Government Expenditure Volatility Harmful for Growth? A Cross-Country Analysis", *Fiscal Studies*, 28(1), 103–120.

Gaspar, V., Jaramillo, L. and Wingender, P. (2016). "Political Institutions, State Building and Tax Capacity: Crossing the Tipping Point", IMF WP 16/233.

Gaspar, V., and Selassie, A. (2017). "Taxes, Debt and Development: A One-Percent Rule to Raise Revenues in Africa", IMF Blog 2017/12/05.

Gentry, W.M., and Ladd, H.F. (1994). "State Tax Structure and Multiple Policy Objectives". *National Tax Journal*, 47 (4), 747–772.

Groves, H. M., and Kahn, C.H. (1952). "The Stability of State and Local Tax Yields". *The American Economic Review*", 42 (1), 87–102.

Gygli, S., Haelg, F., Potrafke, N. and Sturm, J. (2019): The KOF Globalisation Index – Revisited, Review of International Organizations, 14(3), 543-574

Hettich, W., and Winer, S.L. (1984). "A Positive Model of Tax Structure." *Journal of Public Economics*, 23, 67–87.

Hirschman, A. O. (1964). "The paternity of an index". *The American Economic Review*, *54*(5), 761–762.

International Monetary Fund (2016). "Diversifying Government Revenue in the GCC: Next Steps", GCC, Annual Meeting of Ministers of Finance and Central Bank Governors, Riyadh, October.

International Monetary Fund (2009), "Fiscal Rules—Anchoring Expectations for Sustainable Public Finances". Washington: International Monetary Fund.

Loayza, N., Rancière, R., Servén L, and Ventura, J. (2007)."Macroeconomic volatility and welfare in developing countries: an introduction", *World Bank Economic Review*, 21, 343-357.

Kilby, N. (2014). "Does Tax Revenue Diversification Help States Weather Economic Downturns? Evidence from the Great Recession", MPA/MPP Capstone Projects. 12.

Medina, L., Jonelis, A. and Cangul, M. (2017). "The Informal Economy in Sub-Saharan Africa: Size and Determinants", IMF WP 17/156.

Marshall, Monty G. and Gurr, Ted Robert 2018. Political Regime Characteristics and Transitions, 1800-2017, Center for Systemic Peace.

Papageorgiou, C., and Spatafora, N. (2012). Economic Diversification in LICs: Stylized Facts and Macroeconomic Implications, IMF Staff Discussion Note No. SDN/12/13 (Washington, DC).

Roberts, T. (2014). When bigger is better: A critique of the Herfindahl-Hirschman Index's use to evaluate mergers in network industries. *Pace L. Rev.*, *34*, 894–946.

Schunk, D. and Porka, S. (2005). "State-Local Revenue Diversification, Stability, and Growth: Time Series Evidence", *The Review of Regional Studies*, 35 (3), 246–65.

Suyderhound, J. (1994). "State-Local Revenue Diversification, Balance, and Fiscal Performance." *Public Finance Review*, 22(2):168–194.

Svirydzenka, K. 2016. Introducing a New Broad-based Index of Financial Development. IMF Working Paper 16/5, Washington DC

Theil, H. (1972). Statistical decomposition analysis; with applications in the social and administrative sciences, 4, HA33, T4.

Thornton, J. (2014). "Does foreign aid reduce tax revenue? Further evidence", *Applied Economics* 46(4), 359–373.

White, C.F. (1983). "Trade-off in Growth and Stability in State Taxes", *National Tax Journal* 36, 103–114.

Wilford, Walton T. (1965). "State Tax Stability Criteria and the Revenue-Income Elasticity Coefficient Reconsidered." *National Tax Journal,* 18, 304–312.

Williams, W. V., Anderson, R.M., Froehle, D.O., and Lamb, K.L. (1973). "The Stability, Growth and Stabilizing Influence of State Taxes." *National. Tax Journal* 36, 267–273.

World Bank (2014). Introduction to poverty analysis. World Bank WP No 90288 (Washington, DC: World Bank Group).

Annex 1. Sample and Country Groups

Country	Income group	Region	Small country	Fragile country	Resource rich country
Algeria	UMIC	MENA	No	No	Yes
Angola	UMIC	SSA	No	No	Yes
Anguilla	HIC	ECA	No	No	No
Antigua and Barbuda	HIC	LAC	Yes	No	No
Armenia, Republic of	LMIC	ECA	No	No	No
Australia	HIC	EAP	No	No	Yes
Austria	HIC	ECA	No	No	No
Azerbaijan, Republic of	UMIC	ECA	No	No	Yes
Bahamas, The	HIC	LAC	Yes	No	No
Bahrain, Kingdom of	HIC	MENA	Yes	No	Yes
Bangladesh	LIC	SA	No	No	No
Barbados	HIC	LAC	Yes	No	No
Belgium	HIC	ECA	No	No	No
Benin	LIC	SSA	No	No	No
Bhutan	LMIC	SA	Yes	No	No
Bolivia	LMIC	LAC	No	No	Yes
Botswana	UMIC	SSA	Yes	No	Yes
Brazil	UMIC	LAC	No	No	No
Bulgaria	UMIC	ECA	No	No	No
Burkina Faso	LIC	SSA	No	No	No
Burundi	LIC	SSA	No	Yes	No
Cabo Verde	LMIC	SSA	Yes	No	No
Cambodia	LIC	EAP	No	No	No
Canada	HIC	NA	No	No	Yes
China, P.R.: Mainland	UMIC	EAP	No	No	No
Colombia	UMIC	LAC	No	No	Yes
Congo, Democratic Republic of	LIC	SSA	No	Yes	Yes
Congo, Republic of	LMIC	SSA	No	No	Yes
Costa Rica	UMIC	LAC	No	No	No
Côte d'Ivoire	LMIC	SSA	No	Yes	Yes
Croatia	HIC	ECA	No	No	No
Cyprus	HIC	ECA	Yes	No	No
Czech Republic	HIC	ECA	No	No	No
Denmark	HIC	ECA	No	No	No
Dominica	UMIC	LAC	Yes	No	No
Dominican Republic	UMIC	LAC	No	No	No
Egypt	LMIC	MENA	No	No	No
El Salvador	LMIC	LAC	No	No	No
Equatorial Guinea	UMIC	SSA	Yes	No	Yes
Estonia	HIC	ECA	Yes	No	No
Ethiopia	LIC	SSA	No	No	No
Finland	HIC	ECA	No	No	No
France	HIC	ECA	No	No	No
Georgia	LMIC	ECA	No	No	No
Germany	HIC	ECA	No	No	No
Ghana	LMIC	SSA	No	No	Yes
Greece	HIC	ECA	No	No	No
Grenada	UMIC	LAC	Yes	No	No
Guatemala	LMIC	LAC	No	No	No
Honduras	LMIC	LAC	No	No	No
Hungary	UMIC	EAP	No	No	No
Iceland	HIC	EAP	Yes	No	No
India	LMIC	SA	No	No	No
Indonesia	LMIC	EAP	No	No	Yes
Ireland	HIC	EAP	No	No	No
Israel	HIC	EAP	No	No	No
Italy	HIC	ECA	No	No	No
Jamaica	UMIC	LAC	Yes	No	No
Japan	HIC	EAP	No	No	No
Jordan	UMIC	EAP	No	No	No
Kenya	LIC	SSA	No	No	No
Kiribati	LMIC	EAP	Yes	Yes	No
Korea, Republic of	HIC	EAP	No	No	No
Kosovo, Republic of	LMIC	ECA	No	Yes	No
Kuwait	HIC	MENA	No	No	Yes
Kyrgyz Republic	LMIC	ECA	No	No	No
Latvia	HIC	ECA	No	No	No
Lebanon	UMIC	MENA	No	Yes	No
Lesotho	LMIC	SSA	Yes	No	No
Lithuania	HIC	ECA	No	No	No
Luxembourg	HIC	ECA	No	No	No
Malawi	LIC	SSA	No	No	No
Malaysia	UMIC	EAP	No	No	No
Maldives	UMIC	SA	Yes	No	No
Malta	HIC	MENA	Yes	No	No
Marshall Islands, Republic of	UMIC	EAP	Yes	Yes	No
Mauritius	UMIC	SSA	Yes	No	No
Micronesia, Federated States of	LMIC	EAP	Yes	Yes	No
Moldova	LMIC	ECA	No	No	No
Montserrat	HIC	ECA	No	No	No
Morocco	LMIC	MENA	No	No	No
Mozambique	LIC	SSA	No	No	Yes
Namibia	UMIC	SSA	Yes	No	No
Nepal	LIC	SA	No	No	No
Netherlands	HIC	ECA	No	No	No
Norway	HIC	ECA	No	No	Yes
Oman	HIC	MENA	No	No	Yes
Pakistan	LMIC	SA	No	No	No
Paraguay	LMIC	LAC	No	No	No
Peru	UMIC	LAC	No	No	Yes
Philippines	LMIC	EAP	No	No	No
Poland	HIC	ECA	No	No	No
Portugal	HIC	ECA	No	No	No
Qatar	HIC	MENA	Yes	No	Yes
Romania	UMIC	ECA	No	No	No
Samoa	LMIC	EAP	Yes	No	No
San Marino	HIC	ECA	Yes	No	No
São Tomé and Príncipe	LMIC	SSA	Yes	No	No
Serbia, Republic of	UMIC	ECA	No	No	No
Seychelles	UMIC	SSA	Yes	No	No
Sierra Leone	LIC	SSA	No	Yes	No
Singapore	HIC	EAP	No	No	No
Slovak Republic	HIC	ECA	No	No	No
Slovenia	HIC	ECA	No	No	No
Solomon Islands	LMIC	EAP	Yes	Yes	No
South Africa	UMIC	SSA	No	No	Yes
Spain	HIC	ECA	No	No	No
Sri Lanka	LMIC	SA	No	No	No
St. Kitts and Nevis	HIC	LAC	Yes	No	No
St. Lucia	UMIC	LAC	Yes	No	No
St. Vincent and the Grenadines	UMIC	LAC	Yes	No	No
Swaziland	LMIC	SSA	Yes	No	No
Sweden	HIC	ECA	No	No	No
Switzerland	HIC	ECA	No	No	No
Syrian Arab Republic	LMIC	MENA	No	Yes	Yes
Thailand	UMIC	EAP	No	No	No
Togo	LIC	SSA	No	Yes	No
Tunisia	UMIC	MENA	No	No	No
Turkey	UMIC	ECA	No	No	No
Uganda	LIC	SSA	No	No	No
Ukraine	LMIC	ECA	No	No	No
United Arab Emirates	HIC	MENA	No	No	Yes
United Kingdom	HIC	ECA	No	No	No
United States	HIC	NA	No	No	No
Vietnam	LMIC	EAP	No	No	No
West Bank and Gaza	LMIC	MENA	No	Yes	No
Yemen, Republic of	LMIC	MENA	No	Yes	Yes

Income groups: HIC: High Income Country; UMIC: Upper Middle Income Country; LMIC: Lower Middle Income. Country; LIC: Low Income Country. Regions: ECA: Europe and Central Asia; EAP: East Asia and Pacific; SA: South Asia; LAC: Latin America; SSA: Sub-Saharan Africa; NA: North America; MENA: Middle East and North Africa

Annex 2. Data Sources and Descriptions

Variables	Description	Data sources
Real GDP_pc	Real GDP per capita	IMF's World Economic Outlook (WEO) database
Real GDP_pc_squared	Square of real GDP per capita	Authors' calculations
Financial development	Index of financial development	Svirydzenka (2016)
Trade openness	Sum of imports and exports over GDP	World Bank's World Development Indicators
Exports concentration index	Theil index of exports concentration	IMF datasets
Natural resource rents	Natural resource rents in percentage of GDP	World Bank's World Development Indicators
Net ODA received_pc	Net Official Development Assistance received per capita	World Bank's World Development Indicators
Informal share	Share of the informal sector in the economy (percentage)	Medina, Jonelis and Cangul (2017)
Inflation rate / Informality	Consumer price index growth rate (in percentage)	IMF's World Economic Outlook (WEO) database
De jure globalization index	It measures the extent of investment restrictions, capital account oppenness and international investment agreements.	Gygli et al. (2019)
GDP growth	Rate of real GDP growth	IMF's World Economic Outlook (WEO) database
Human capital index	Human capital index, based on years of schooling and returns to education	Penn World Tables 9.1
IMF program dummy	Binary variable taking the value of 1 if the country has an IMF program and 0 otherwise	IMF datasets
Democracy	Degree of democracy. The polity 2 score ranges from -10 to +10, with higher value representing more democracy.	Marshall and Gurr (2018)
Political polarization	It measures the maximum polarization between the executive party and the four principle parties of the legislature.	Database of Political Institutions
Government fractionalization	It measures the probability that two deputies picked at random from among the government parties will be of different parties.	Database of Political Institutions
Political/Government stability	It measures the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means.	World Bank's Worldwide Governance Indicators
Largest gov. party orient.	It measures the largest party orientation with respect to economic policy	Database of Political Institutions
Quality of bureaucracy	It measures the institutional strength and quality of the bureaucracy	International Country Risk Guide (ICRG)
Rule of law	It measures the extent to which agents have confidence in and abide by the rules of society	World Bank's Worldwide Governance Indicators
Government effectiveness	It measures the quality of public services, the quality of the civil service and the degree of its independence from political pressures and the quality of policy formulation	World Bank's Worldwide Governance Indicators
Voice and accountability	It measures the extent to which a country's citizens are able to participate in selecting their government, and freedom of expression, association and a free media	World Bank's Worldwide Governance Indicators
Control of corruption	It represents the extent to which public power is exercised for private gain, including petty and grand forms of corruption.	World Bank's Worldwide Governance Indicators
Agriculture VA	Agriculture valued added (in percentage of GDP)	World Bank's World Development Indicators
Growth volatility	Standard deviation of GDP growth (using rolling window method)	Authors' calculations
Regulatory quality	It measures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	World Bank's Worldwide Governance Indicators
Polity 2	Measure of the degree of democracy/ autocracy ranging from +10 (strongly democratic) to !10 (strongly autocratic)	Marshall and Gurr (2018)
Political risk	Assessment of countries's political stability	International Country Risk Guide (ICRG)
Internal conflicts	Assessment of political violence in the country and its actual or potential impact on governance	
Fiscal rules	Dummy: 1 if numerical fiscal rule in place, 0 otherwise	IMF Fiscal Rules Dataset
Foreign direct investment (FDI), net inflows	Direct investment equity flows in the reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital.	World Bank's Worldwide Governance Indicators
Public debt (% GDP)	General government total debt, percent of fiscal year GDP	
Overall fiscal balance	Overall fiscal balance percentage of GDP	IMF's World Economic Outlook (WEO) database
Exchange rate	Official exchange rate (LCU per US$, period average)	World Bank's Worldwide Governance Indicators

Annex 3. Countries with Filled up Missing Observations

Country	Year(s)
Armenia, Republic of	2003
Brazil	2000-2005
Burundi	2010 & 2015
Cabo Verde	2010-2015
Canada	2010 & 2015
China, P.R: Mainland	2000-2004
Congo, Republic of	2000-2003
Costa Rica	2000-2001
Croatia	2000-
Egypt	2000-2001
Georgia	2000-2002
Honduras	2000-2002
Indonesia	2000 & 2007
Jamaica	2000-2002
Korea, Republic of	2000 & 2006
Lesotho	2000-2002
Mauritius	2000-2001
Moldova	2000-2001
Seychelles	2000-2004
Turkey	2000 & 2007

Annex 4. Full RDI-based country ranking

2000-2004			2005-2009			2010-2015		
Rank	**Country**	**RDI**	**Rank**	**Country**	**RDI**	**Rank**	**Country**	**RDI**
1	Japan	0.053	1	Japan	0.055	1	Japan	0.057
2	France	0.160	2	United Kingdom	0.140	2	France	0.153
3	United Kingdom	0.167	3	France	0.149	3	United Kingdom	0.172
4	United States	0.188	4	United States	0.156	4	United States	0.176
5	South Africa	0.192	5	Switzerland	0.182	5	South Africa	0.178
6	Switzerland	0.193	6	South Africa	0.187	6	Switzerland	0.181
7	Norway	0.216	7	Israel	0.192	7	Singapore	0.186
8	Australia	0.229	8	Australia	0.193	8	Australia	0.193
9	Israel	0.230	9	Norway	0.204	9	Norway	0.207
10	Spain	0.243	10	Spain	0.209	10	Korea, Republic of	0.217
11	Luxembourg	0.245	11	Belgium	0.235	11	Israel	0.220
12	Belgium	0.252	12	Cyprus	0.254	12	Belgium	0.230
13	Netherlands	0.266	13	Luxembourg	0.255	13	Spain	0.238
14	Ukraine	0.285	14	Korea, Republic of	0.266	14	Luxembourg	0.252
15	Ireland	0.289	15	Netherlands	0.287	15	Ireland	0.265
16	Cyprus	0.300	16	Ireland	0.297	16	Cyprus	0.277
17	Oman	0.301	17	Barbados	0.310	17	Iceland	0.297
18	Finland	0.305	18	Germany	0.323	18	Netherlands	0.302
19	Italy	0.318	19	Poland	0.330	19	Italy	0.330
20	Greece	0.334	20	Italy	0.335	20	Malta	0.330
21	Yemen, Republic of	0.337	21	Finland	0.335	21	Germany	0.332
22	Latvia	0.339	22	Ukraine	0.338	22	Georgia	0.338
23	Poland	0.341	23	Oman	0.340	23	Greece	0.339
24	Barbados	0.349	24	Greece	0.344	24	Portugal	0.341
25	Czech Republic	0.352	25	Iceland	0.344	25	Oman	0.342
26	Bhutan	0.352	26	Indonesia	0.347	26	India	0.345
27	Germany	0.359	27	Latvia	0.350	27	Poland	0.350
28	Denmark	0.378	28	Malta	0.355	28	Kenya	0.364
29	Iceland	0.378	29	Czech Republic	0.358	29	Finland	0.367
30	Malaysia	0.385	30	India	0.363	30	Azerbaijan, Republic of	0.368
31	Portugal	0.386	31	Denmark	0.374	31	Barbados	0.370
32	Malta	0.405	32	Azerbaijan, Republic of	0.375	32	Indonesia	0.379
33	Montserrat	0.406	33	Yemen, Republic of	0.382	33	Slovak Republic	0.389
34	Romania	0.408	34	Portugal	0.383	34	Malawi	0.391
35	Austria	0.409	35	Lithuania	0.385	35	Philippines	0.391
36	Philippines	0.427	36	Jamaica	0.387	36	Latvia	0.392
37	Morocco	0.427	37	Montserrat	0.389	37	Denmark	0.396
38	Egypt	0.431	38	Slovenia	0.391	38	Egypt	0.398
39	Slovak Republic	0.434	39	Thailand	0.402	39	Montserrat	0.403
40	Canada	0.436	40	Egypt	0.407	40	Malaysia	0.403
41	Namibia	0.444	41	Romania	0.409	41	Tunisia	0.404
42	Georgia	0.447	42	Austria	0.414	42	Ukraine	0.404
43	India	0.448	43	Slovak Republic	0.415	43	Peru	0.404
44	Slovenia	0.454	44	Philippines	0.419	44	Honduras	0.405
45	Jamaica	0.455	45	Canada	0.427	45	Czech Republic	0.406
46	Sweden	0.462	46	Malaysia	0.428	46	Jamaica	0.415
47	Hungary	0.462	47	Malawi	0.428	47	Brazil	0.415
48	São Tomé and Príncipe	0.465	48	Georgia	0.432	48	Thailand	0.424
49	Thailand	0.468	49	Tunisia	0.433	49	Austria	0.424
50	Lithuania	0.473	50	Kenya	0.434	50	Namibia	0.427
51	Bulgaria	0.476	51	Morocco	0.443	51	Romania	0.431
52	Honduras	0.480	52	Hungary	0.443	52	Yemen, Republic of	0.435
53	Estonia	0.484	53	Peru	0.444	53	Costa Rica	0.435
54	Bahrain, Kingdom of	0.495	54	Honduras	0.445	54	Canada	0.440
55	San Marino	0.501	55	Sweden	0.452	55	Congo, Republic of	0.442
56	St. Kitts and Nevis	0.523	56	El Salvador	0.454	56	Morocco	0.443
57	Tunisia	0.534	57	Brazil	0.465	57	Sweden	0.449
58	St. Vincent and the Grenadines	0.537	58	Namibia	0.481	58	Solomon Islands	0.454
59	Peru	0.547	59	Estonia	0.484	59	Sierra Leone	0.464
60	El Salvador	0.549	60	Congo, Republic of	0.491	60	Micronesia, Federated States of	0.470
61	Swaziland	0.574	61	Turkey	0.518	61	Mozambique	0.473
62	Dominica	0.578	62	Costa Rica	0.533	62	China, P.R.: Mainland	0.474
63	Vietnam	0.585	63	Bhutan	0.542	63	Bhutan	0.483
64	Ghana	0.595	64	Bulgaria	0.543	64	Ghana	0.487

Annex 4. Full RDI-based country ranking (Cont'd)

65	Sierra Leone	0.595	65	China, P.R.: Mainland	0.558	65	Kiribati	0.491
66	Benin	0.607	66	Cabo Verde	0.568	66	El Salvador	0.496
67	Moldova	0.614	67	São Tomé and Príncipe	0.575	67	Estonia	0.497
68	St. Lucia	0.618	68	Ghana	0.589	68	Slovenia	0.498
69	Grenada	0.649	69	Vietnam	0.590	69	São Tomé and Príncipe	0.516
70	Côte d'Ivoire	0.649	70	Armenia, Republic of	0.593	70	Angola	0.521
71	Pakistan	0.656	71	Côte d'Ivoire	0.594	71	Algeria	0.522
72	Armenia, Republic of	0.656	72	Grenada	0.603	72	Swaziland	0.523
73	Colombia	0.665	73	St. Kitts and Nevis	0.608	73	Lithuania	0.524
74	Lesotho	0.684	74	St. Vincent and the Grenadines	0.609	74	Vietnam	0.526
75	Congo, Democratic Republic of	0.688	75	San Marino	0.610	75	Seychelles	0.531
76	Angola	0.693	76	Sierra Leone	0.615	76	Armenia, Republic of	0.534
77	Syrian Arab Republic	0.700	77	Colombia	0.621	77	Turkey	0.544
78	Ethiopia	0.700	78	Congo, Democratic Republic of	0.623	78	Bulgaria	0.550
79	Dominican Republic	0.702	79	Marshall Islands, Republic of	0.629	79	Hungary	0.553
80	Kuwait	0.714	80	St. Lucia	0.632	80	Congo, Democratic Republic of	0.563
81	Croatia	0.720	81	Dominica	0.644	81	Burundi	0.566
82	Congo, Republic of	0.732	82	Croatia	0.647	82	Cabo Verde	0.568
83	Togo	0.751	83	Serbia, Republic of	0.652	83	Bangladesh	0.587
84	Nepal	0.774	84	Benin	0.671	84	Uganda	0.604
85	Mauritius	0.783	85	Swaziland	0.684	85	Lesotho	0.607
86	Kenya	0.799	86	Mauritius	0.688	86	St. Vincent and the Grenadines	0.611
87	Uganda	0.814	87	Uganda	0.702	87	St. Kitts and Nevis	0.611
88	Jordan	0.816	88	Guatemala	0.706	88	Marshall Islands, Republic of	0.628
89	Algeria	0.818	89	Algeria	0.707	89	Serbia, Republic of	0.631
90	Sri Lanka	0.822	90	Moldova	0.716	90	Grenada	0.633
91	Bangladesh	0.824	91	Bangladesh	0.721	91	Samoa	0.635
92	Guatemala	0.875	92	Angola	0.729	92	St. Lucia	0.636
93	Antigua and Barbuda	0.884	93	Dominican Republic	0.736	93	San Marino	0.640
94	Cambodia	1.010	94	Togo	0.738	94	Côte d'Ivoire	0.647
95	Bolivia	1.040	95	Antigua and Barbuda	0.742	95	Guatemala	0.653
96	Bahamas, The	1.203	96	Seychelles	0.749	96	Dominican Republic	0.654
97	Maldives	1.213	97	Jordan	0.749	97	Mauritius	0.659
98	Qatar	1.215	98	Micronesia, Federated States of	0.752	98	Croatia	0.659
99	Anguilla	1.340	99	Kuwait	0.765	99	Dominica	0.669
100	Azerbaijan, Republic of	...	100	Ethiopia	0.773	100	Ethiopia	0.710
101	Botswana	...	101	Syrian Arab Republic	0.779	101	Pakistan	0.722
102	Brazil	...	102	Lesotho	0.790	102	Nepal	0.740
103	Burkina Faso	...	103	Paraguay	0.805	103	Benin	0.741
104	Burundi	...	104	Nepal	0.824	104	Moldova	0.742
105	Cabo Verde	...	105	Equatorial Guinea	0.838	105	Colombia	0.742
106	China, P.R.: Mainland	...	106	Botswana	0.860	106	Antigua and Barbuda	0.750
107	Costa Rica	...	107	Sri Lanka	0.875	107	Jordan	0.755
108	Equatorial Guinea	...	108	Kyrgyz Republic	0.876	108	Paraguay	0.772
109	Indonesia	...	109	Cambodia	0.906	109	Kyrgyz Republic	0.781
110	Kiribati	...	110	Bolivia	0.966	110	Cambodia	0.790
111	Korea, Republic of	...	111	Bahrain, Kingdom of	1.029	111	Kosovo, Republic of	0.833
112	Kosovo, Republic of	...	112	West Bank and Gaza	1.087	112	Botswana	0.842
113	Kyrgyz Republic	...	113	Maldives	1.141	113	Togo	0.857
114	Lebanon	...	114	Bahamas, The	1.162	114	Sri Lanka	0.898
115	Malawi	...	115	Qatar	1.173	115	Lebanon	0.942
116	Marshall Islands, Republic of	...	116	Anguilla	1.350	116	Maldives	1.017
117	Micronesia, Federated States of	...	117	Burkina Faso	1.350	117	West Bank and Gaza	1.041
118	Mozambique	...	118	Burundi	...	118	Bahamas, The	1.117
119	Paraguay	...	119	Kiribati	...	119	Qatar	1.159
120	Samoa	...	120	Kosovo, Republic of	...	120	Bahrain, Kingdom of	1.169
121	Serbia, Republic of	...	121	Lebanon	...	121	United Arab Emirates	1.218
122	Seychelles	...	122	Mozambique	...	122	Anguilla	1.317
123	Singapore	...	123	Pakistan	...	123	Kuwait	1.336
124	Solomon Islands	...	124	Samoa	...	124	Bolivia	1.336
125	Turkey	...	125	Singapore	...	125	Burkina Faso	...
126	United Arab Emirates	...	126	Solomon Islands	...	126	Equatorial Guinea	...
127	West Bank and Gaza	...	127	United Arab Emirates	...	127	Syrian Arab Republic	...

Annex 5. Alternative estimates

Accounting for shift in value added across sectors

Dependent variable: *Revenue diversification index (RDI)*				
	Baseline	Controling for VA share of services		
	(1)	(2)	(3)	(4)
$RDI_{(t-1)}$	0.611***	0.478***	0.459***	0.453***
	(0.011)	(0.024)	(0.022)	(0.023)
Log real $GDP\_pc_{(t-1)}$	-0.6170***	-0.8073***	-0.7172***	-0.7804***
	(0.080)	(0.123)	(0.128)	(0.135)
Log real $GDP\_pc\_squared_{(t-1)}$	0.038***	0.051***	0.0442***	0.0487***
	(0.005)	(0.008)	(0.008)	(0.009)
Financial $development_{(t-1)}$	-0.3958***	-0.6439***	-0.5385***	-0.6052***
	(0.108)	(0.133)	(0.138)	(0.139)
Trade $openness_{(t-1)}$	-0.0318*	-0.0212	-0.0257	-0.0116
	(0.019)	(0.026)	(0.026)	(0.028)
Export concentration $index_{(t-1)}$	0.0252***	0.0294***	0.0339***	0.0302***
	(0.007)	(0.009)	(0.009)	(0.009)
VA Services / VA Agri.		-0.0001***		-0.0001***
		0.000		0.000
VA Services / VA Manuf.			0.0023**	0.0020**
			(0.001)	(0.001)
Constant	2.631***	3.486***	3.137***	3.361***
	(0.346)	(0.518)	(0.540)	(0.564)
Nb. of observations	1141	1089	1074	1074
Countries	97	96	95	95
AR(1)	0.08	0.04	0.05	0.06
AR(2) *p-value*	0.3	0.14	0.25	0.25
Hansen OID (*p-value)*	0.07	0.11	0.2	0.22
Nb. of instruments	70	71	71	72
Year FE	*Yes*	*Yes*	*Yes*	*Yes*
Region FE	*Yes*	*Yes*	*Yes*	*Yes*

Annex 6. Full HHI RDI-based country ranking

2000-2004			2005-2009			2010-2015		
Rank	**Country**	**RDI**	**Rank**	**Country**	**RDI**	**Rank**	**Country**	**RDI**
1	Japan	0.276	1	Japan	0.276	1	Japan	0.277
2	France	0.326	2	United Kingdom	0.316	2	France	0.322
3	Norway	0.328	3	France	0.321	3	South Africa	0.325
4	United Kingdom	0.329	4	Norway	0.322	4	Norway	0.326
5	South Africa	0.329	5	South Africa	0.323	5	United Kingdom	0.332
6	Switzerland	0.341	6	Australia	0.331	6	Switzerland	0.335
7	Oman	0.342	7	United States	0.334	7	Australia	0.335
8	Australia	0.35	8	Switzerland	0.335	8	Singapore	0.342
9	Luxembourg	0.351	9	Israel	0.343	9	United States	0.346
10	United States	0.351	10	Spain	0.347	10	Belgium	0.355
11	Israel	0.356	11	Belgium	0.356	11	Luxembourg	0.356
12	Yemen, Republic of	0.364	12	Luxembourg	0.357	12	Spain	0.362
13	Belgium	0.364	13	Oman	0.368	13	Israel	0.363
14	Spain	0.366	14	Ireland	0.379	14	Korea, Republic of	0.364
15	Ukraine	0.369	15	Cyprus	0.381	15	Ireland	0.368
16	Ireland	0.373	16	Netherlands	0.384	16	Oman	0.371
17	Finland	0.377	17	India	0.385	17	India	0.372
18	Bhutan	0.379	18	Germany	0.389	18	Iceland	0.382
19	Netherlands	0.379	19	Korea, Republic of	0.390	19	Malta	0.383
20	Italy	0.392	20	Finland	0.391	20	Cyprus	0.385
21	Malaysia	0.395	21	Yemen, Republic of	0.394	21	Kenya	0.389
22	Cyprus	0.401	22	Italy	0.396	22	Netherlands	0.390
23	Germany	0.404	23	Iceland	0.403	23	Germany	0.393
24	Czech Republic	0.405	24	Indonesia	0.403	24	Italy	0.396
25	Iceland	0.414	25	Malta	0.406	25	Malawi	0.407
26	Austria	0.416	26	Czech Republic	0.406	26	Finland	0.408
27	Latvia	0.419	27	Ukraine	0.408	27	Malaysia	0.409
28	Denmark	0.425	28	Jamaica	0.414	28	Philippines	0.410
29	Greece	0.429	29	Austria	0.417	29	Portugal	0.416
30	Malta	0.43	30	Barbados	0.418	30	Georgia	0.417
31	Montserrat	0.431	31	Latvia	0.419	31	Tunisia	0.419
32	Philippines	0.438	32	Malaysia	0.420	32	Indonesia	0.419
33	Poland	0.438	33	Egypt	0.420	33	Egypt	0.419
34	Barbados	0.438	34	Azerbaijan, Republic of	0.421	34	Austria	0.422
35	Namibia	0.441	35	Denmark	0.423	35	Azerbaijan, Republic of	0.423
36	Portugal	0.442	36	Lithuania	0.425	36	Jamaica	0.428
37	Jamaica	0.448	37	Montserrat	0.425	37	Yemen, Republic of	0.430
38	Egypt	0.449	38	Poland	0.427	38	Montserrat	0.431
39	India	0.45	39	Philippines	0.429	39	Greece	0.432
40	San Marino	0.455	40	Thailand	0.432	40	Peru	0.435
41	São Tomé and Príncipe	0.46	41	Slovenia	0.433	41	Poland	0.439
42	Lithuania	0.46	42	Malawi	0.434	42	Denmark	0.439
43	Slovenia	0.462	43	Greece	0.434	43	Bhutan	0.439
44	Bahrain, Kingdom of	0.466	44	Kenya	0.439	44	Latvia	0.442
45	Hungary	0.467	45	Tunisia	0.441	45	Thailand	0.444
46	Romania	0.469	46	Portugal	0.443	46	Sierra Leone	0.445
47	Canada	0.469	47	Morocco	0.457	47	Namibia	0.447
48	Estonia	0.471	48	Hungary	0.459	48	Czech Republic	0.449
49	Sweden	0.475	49	Peru	0.459	49	Ukraine	0.452
50	Morocco	0.476	50	Bhutan	0.459	50	Slovak Republic	0.452
51	Slovak Republic	0.482	51	Canada	0.462	51	Micronesia, Federated States of	0.457
52	Thailand	0.485	52	Sweden	0.465	52	Sweden	0.459
53	Bulgaria	0.498	53	Slovak Republic	0.468	53	Barbados	0.460
54	Vietnam	0.5	54	Romania	0.472	54	Mozambique	0.462
55	Georgia	0.506	55	Namibia	0.478	55	Congo, Republic of	0.462
56	Syrian Arab Republic	0.507	56	Estonia	0.482	56	Algeria	0.464
57	Tunisia	0.51	57	Georgia	0.484	57	Canada	0.471
58	Colombia	0.512	58	El Salvador	0.485	58	Honduras	0.471
59	St. Kitts and Nevis	0.53	59	San Marino	0.490	59	Morocco	0.476
60	El Salvador	0.532	60	Marshall Islands, Republic of	0.491	60	Solomon Islands	0.477
61	Honduras	0.534	61	Vietnam	0.494	61	Ghana	0.477
62	St. Vincent and the Grenadines	0.537	62	Honduras	0.495	62	Vietnam	0.478
63	Swaziland	0.539	63	Congo, Republic of	0.498	63	Kiribati	0.479
64	Peru	0.543	64	Colombia	0.507	64	Romania	0.488

Annex 6. Full HHI RDI-based country ranking (Cont'd)

65	Ghana	0.553	65	Brazil	0.518	65	Marshall Islands, Republic of	0.490
66	Sierra Leone	0.554	66	Turkey	0.519	66	Brazil	0.493
67	Dominica	0.561	67	Cabo Verde	0.534	67	Estonia	0.495
68	Pakistan	0.573	68	Costa Rica	0.539	68	Seychelles	0.496
69	Benin	0.587	69	São Tomé and Príncipe	0.541	69	Costa Rica	0.500
70	Angola	0.588	70	Ghana	0.550	70	San Marino	0.502
71	St. Lucia	0.59	71	Bulgaria	0.558	71	Angola	0.503
72	Moldova	0.599	72	China, P.R.: Mainland	0.561	72	Swaziland	0.503
73	Lesotho	0.608	73	Côte d'Ivoire	0.563	73	Slovenia	0.505
74	Côte d'Ivoire	0.611	74	Sierra Leone	0.566	74	El Salvador	0.509
75	Ethiopia	0.613	75	Micronesia, Federated States of	0.575	75	China, P.R.: Mainland	0.520
76	Congo, Democratic Republic of	0.618	76	Congo, Democratic Republic of	0.576	76	Lithuania	0.523
77	Kuwait	0.619	77	St. Kitts and Nevis	0.580	77	São Tomé and Príncipe	0.527
78	Grenada	0.623	78	St. Vincent and the Grenadines	0.581	78	Congo, Democratic Republic of	0.531
79	Kenya	0.633	79	Armenia, Republic of	0.582	79	Burundi	0.532
80	Armenia, Republic of	0.633	80	Syrian Arab Republic	0.583	80	Cabo Verde	0.534
81	Congo, Republic of	0.634	81	Algeria	0.585	81	Pakistan	0.537
82	Dominican Republic	0.637	82	Guatemala	0.589	82	Hungary	0.537
83	Croatia	0.64	83	Croatia	0.593	83	Turkey	0.540
84	Togo	0.656	84	St. Lucia	0.596	84	Bangladesh	0.542
85	Uganda	0.662	85	Serbia, Republic of	0.599	85	Guatemala	0.547
86	Nepal	0.669	86	Grenada	0.605	86	Armenia, Republic of	0.548
87	Algeria	0.7	87	Swaziland	0.615	87	Uganda	0.553
88	Mauritius	0.701	88	Kuwait	0.620	88	Bulgaria	0.563
89	Jordan	0.706	89	Angola	0.620	89	St. Kitts and Nevis	0.580
90	Bangladesh	0.714	90	Benin	0.622	90	St. Vincent and the Grenadines	0.580
91	Guatemala	0.717	91	Uganda	0.624	91	Lesotho	0.582
92	Antigua and Barbuda	0.727	92	Dominica	0.626	92	Serbia, Republic of	0.592
93	Sri Lanka	0.728	93	Seychelles	0.631	93	Samoa	0.596
94	Bolivia	0.806	94	Mauritius	0.631	94	St. Lucia	0.600
95	Cambodia	0.819	95	Bangladesh	0.640	95	Côte d'Ivoire	0.604
96	Bahamas, The	0.914	96	Togo	0.653	96	Colombia	0.610
97	Maldives	0.92	97	Jordan	0.659	97	Croatia	0.613
98	Qatar	0.921	98	Moldova	0.664	98	Dominican Republic	0.615
99	Anguilla	0.984	99	Botswana	0.665	99	Ethiopia	0.615
100	Azerbaijan, Republic of	...	100	Dominican Republic	0.669	100	Mauritius	0.615
101	Botswana	...	101	Paraguay	0.669	101	Grenada	0.625
102	Brazil	...	102	Ethiopia	0.672	102	Paraguay	0.640
103	Burkina Faso	...	103	Antigua and Barbuda	0.684	103	Dominica	0.641
104	Burundi	...	104	Nepal	0.688	104	Nepal	0.645
105	Cabo Verde	...	105	Lesotho	0.692	105	Botswana	0.650
106	China, P.R.: Mainland	...	106	Equatorial Guinea	0.721	106	Jordan	0.655
107	Costa Rica	...	107	Sri Lanka	0.737	107	Kyrgyz Republic	0.661
108	Equatorial Guinea	...	108	Kyrgyz Republic	0.740	108	Benin	0.664
109	Indonesia	...	109	Bolivia	0.749	109	Cambodia	0.676
110	Kiribati	...	110	Cambodia	0.750	110	Moldova	0.676
111	Korea, Republic of	...	111	Bahrain, Kingdom of	0.796	111	Antigua and Barbuda	0.698
112	Kosovo, Republic of	...	112	West Bank and Gaza	0.871	112	Lebanon	0.728
113	Kyrgyz Republic	...	113	Maldives	0.882	113	Togo	0.736
114	.ao People's Democratic Republi	...	114	Bahamas, The	0.889	114	Kosovo, Republic of	0.737
115	Lebanon	...	115	Qatar	0.896	115	Sri Lanka	0.746
116	Malawi	...	116	Anguilla	0.988	116	Maldives	0.787
117	Marshall Islands, Republic of	...	117	Burkina Faso	0.896	117	West Bank and Gaza	0.846
118	Micronesia, Federated States of	...	118	Burundi	0.988	118	Bahamas, The	0.859
119	Mozambique	...	119	Kiribati	...	119	Bahrain, Kingdom of	0.868
120	Nicaragua	...	120	Kosovo, Republic of	...	120	Qatar	0.887
121	Nigeria	...	121	Lebanon	...	121	United Arab Emirates	0.920
122	Palau	...	122	Mozambique	...	122	Anguilla	0.974
123	Paraguay	...	123	Pakistan	...	123	Kuwait	0.977
124	Samoa	...	124	Samoa	...	124	Bolivia	...
125	Serbia, Republic of	...	125	Singapore	...	125	Burkina Faso	...
126	Seychelles	...	126	Solomon Islands	...	126	Equatorial Guinea	...
127	Singapore	...	127	United Arab Emirates	...	127	Syrian Arab Republic	...

Annex 7. Adjusted (accounting for non-tax revenue) RDI-based country ranking

2000-2004			2005-2009			2010-2015		
Rank	**Country**	**RDI**	**Rank**	**Country**	**RDI**	**Rank**	**Country**	**RDI**
1	Japan	0.044	1	Japan	0.049	1	Japan	0.054
2	Switzerland	0.151	2	Switzerland	0.143	2	Switzerland	0.142
3	Israel	0.195	3	United Kingdom	0.153	3	Singapore	0.147
4	United Kingdom	0.197	4	Israel	0.169	4	United Kingdom	0.176
5	Netherlands	0.210	5	Korea, Republic of	0.209	5	Korea, Republic of	0.187
6	Luxembourg	0.238	6	Netherlands	0.225	6	Israel	0.196
7	Ukraine	0.241	7	Spain	0.230	7	Belgium	0.225
8	Finland	0.244	8	Belgium	0.243	8	Luxembourg	0.231
9	Spain	0.258	9	Luxembourg	0.250	9	Netherlands	0.237
10	Belgium	0.264	10	Finland	0.260	10	Spain	0.243
11	Iceland	0.323	11	Ukraine	0.264	11	Iceland	0.254
12	Malta	0.333	12	Indonesia	0.273	12	Malta	0.282
13	Morocco	0.339	13	Iceland	0.289	13	Finland	0.283
14	India	0.346	14	Malta	0.306	14	Indonesia	0.293
15	Czech Republic	0.347	15	India	0.313	15	India	0.309
16	Austria	0.352	16	Jamaica	0.335	16	Ukraine	0.315
17	Jamaica	0.364	17	Austria	0.336	17	Honduras	0.330
18	Philippines	0.379	18	Czech Republic	0.338	18	Peru	0.335
19	Honduras	0.382	19	Thailand	0.356	19	Egypt	0.339
20	San Marino	0.387	20	Honduras	0.359	20	Austria	0.346
21	Hungary	0.398	21	Peru	0.366	21	Georgia	0.365
22	Egypt	0.399	22	Egypt	0.368	22	Czech Republic	0.371
23	Thailand	0.405	23	Barbados	0.372	23	Montserrat	0.372
24	Estonia	0.407	24	Hungary	0.374	24	Thailand	0.374
25	Sweden	0.426	25	El Salvador	0.375	25	Morocco	0.376
26	Barbados	0.426	26	Morocco	0.386	26	Jamaica	0.376
27	Montserrat	0.435	27	Philippines	0.387	27	Tunisia	0.390
28	Bhutan	0.435	28	Montserrat	0.388	28	Costa Rica	0.391
29	São Tomé and Príncipe	0.448	29	Georgia	0.403	29	Philippines	0.395
30	St. Kitts and Nevis	0.451	30	Tunisia	0.404	30	China, P.R.: Mainland	0.395
31	Georgia	0.454	31	Estonia	0.404	31	Sweden	0.409
32	Peru	0.464	32	Sweden	0.411	32	Barbados	0.416
33	Moldova	0.471	33	China, P.R.: Mainland	0.444	33	El Salvador	0.418
34	St. Vincent and the Grenadines	0.495	34	Costa Rica	0.472	34	Estonia	0.426
35	Tunisia	0.506	35	Kenya	0.507	35	Solomon Islands	0.429
36	El Salvador	0.517	36	Armenia, Republic of	0.524	36	Lithuania	0.438
37	Angola	0.520	37	Croatia	0.551	37	Kenya	0.455
38	Dominica	0.527	38	Colombia	0.556	38	Hungary	0.460
39	Namibia	0.560	39	Angola	0.560	39	Bhutan	0.464
40	St. Lucia	0.598	40	Serbia, Republic of	0.568	40	Namibia	0.470
41	Armenia, Republic of	0.617	41	San Marino	0.572	41	Armenia, Republic of	0.477
42	Swaziland	0.629	42	Congo, Democratic Republic of	0.573	42	Ghana	0.481
43	Grenada	0.629	43	Namibia	0.582	43	Sierra Leone	0.523
44	Croatia	0.637	44	Azerbaijan, Republic of	0.589	44	São Tomé and Príncipe	0.526
45	Jordan	0.642	45	Bangladesh	0.600	45	Angola	0.530
46	Bangladesh	0.650	46	Moldova	0.605	46	Algeria	0.541
47	Colombia	0.651	47	St. Kitts and Nevis	0.614	47	Serbia, Republic of	0.544
48	Mauritius	0.658	48	St. Vincent and the Grenadines	0.616	48	Malawi	0.544
49	Nepal	0.697	49	São Tomé and Príncipe	0.617	49	Seychelles	0.551
50	Sierra Leone	0.747	50	Mauritius	0.625	50	Congo, Democratic Republic of	0.561
51	Lesotho	0.749	51	Jordan	0.635	51	Lesotho	0.563
52	Dominican Republic	0.750	52	Dominica	0.635	52	Croatia	0.569
53	Congo, Democratic Republic of	0.757	53	Marshall Islands, Republic of	0.635	53	St. Kitts and Nevis	0.578
54	Algeria	0.786	54	Malawi	0.648	54	St. Vincent and the Grenadines	0.578
55	Sri Lanka	0.787	55	Grenada	0.649	55	Samoa	0.594
56	Ghana	0.808	56	St. Lucia	0.658	56	Dominica	0.597
57	Togo	0.837	57	Ghana	0.697	57	Mauritius	0.602
58	Antigua and Barbuda	0.902	58	Bhutan	0.708	58	Bangladesh	0.603
59	Syrian Arab Republic	0.911	59	Cabo Verde	0.731	59	Paraguay	0.603
60	Guatemala	0.950	60	Paraguay	0.734	60	Azerbaijan, Republic of	0.607
61	Congo, Republic of	0.960	61	Seychelles	0.739	61	Swaziland	0.610
62	Cambodia	1.021	62	Algeria	0.740	62	Mozambique	0.610
63	Kenya	1.142	63	Swaziland	0.757	63	Colombia	0.612
64	Uganda	1.196	64	Dominican Republic	0.784	64	San Marino	0.614

Annex 7. Adjusted (accounting for non-tax revenue) RDI-based country ranking (Cont'd)

65	Maldives	1.335	65	Botswana	0.784	65	Marshall Islands, Republic of	0.633
66	Bahrain, Kingdom of	1.340	66	Antigua and Barbuda	0.786	66	St. Lucia	0.661
67	Qatar	1.379	67	Lesotho	0.792	67	Jordan	0.679
68	Oman	1.686	68	Nepal	0.812	68	Grenada	0.693
69	Anguilla	1.779	69	Sierra Leone	0.814	69	Nepal	0.694
70	Kuwait	1.846	70	Guatemala	0.823	70	Moldova	0.694
71	Bahamas, The	1.888	71	Togo	0.888	71	Cabo Verde	0.694
72	Australia	...	72	Equatorial Guinea	0.897	72	Dominican Republic	0.709
73	Azerbaijan, Republic of	...	73	Kyrgyz Republic	0.901	73	Burundi	0.732
74	Benin	...	74	West Bank and Gaza	0.930	74	Antigua and Barbuda	0.732
75	Bolivia	...	75	Micronesia, Federated States of	0.946	75	Kyrgyz Republic	0.738
76	Botswana	...	76	Cambodia	0.975	76	Botswana	0.766
77	Brazil	...	77	Congo, Republic of	0.993	77	Guatemala	0.779
78	Bulgaria	...	78	Maldives	1.003	78	Togo	0.819
79	Burkina Faso	...	79	Uganda	1.013	79	Micronesia, Federated States of	0.839
80	Burundi	...	80	Syrian Arab Republic	1.022	80	Cambodia	0.894
81	Cabo Verde	...	81	Sri Lanka	1.031	81	Congo, Republic of	0.898
82	Canada	...	82	Qatar	1.358	82	Maldives	0.910
83	China, P.R.: Mainland	...	83	Oman	1.603	83	Uganda	0.925
84	Costa Rica	...	84	Bahamas, The	1.765	84	Sri Lanka	1.047
85	Cyprus	...	85	Anguilla	1.784	85	West Bank and Gaza	1.077
86	Côte d'Ivoire	...	86	Kuwait	2.013	86	Kiribati	1.086
87	Denmark	...	87	Bahrain, Kingdom of	2.324	87	Lebanon	1.150
88	Equatorial Guinea	...	88	Australia	...	88	Qatar	1.382
89	Ethiopia	...	89	Benin	...	89	United Arab Emirates	1.465
90	France	...	90	Bolivia	...	90	Anguilla	1.648
91	Germany	...	91	Brazil	...	91	Oman	1.682
92	Greece	...	92	Bulgaria	...	92	Bahamas, The	1.691
93	Indonesia	...	93	Burkina Faso	...	93	Bahrain, Kingdom of	2.927
94	Ireland	...	94	Burundi	...	94	Kuwait	3.383
95	Italy	...	95	Canada	...	95	Australia	...
96	Kiribati	...	96	Cyprus	...	96	Benin	...
97	Korea, Republic of	...	97	Côte d'Ivoire	...	97	Bolivia	...
98	Kosovo, Republic of	...	98	Denmark	...	98	Brazil	...
99	Kyrgyz Republic	...	99	Ethiopia	...	99	Bulgaria	...
100	Latvia	...	100	France	...	100	Burkina Faso	...
101	Lebanon	...	101	Germany	...	101	Canada	...
102	Lithuania	...	102	Greece	...	102	Cyprus	...
103	Malawi	...	103	Ireland	...	103	Côte d'Ivoire	...
104	Malaysia	...	104	Italy	...	104	Denmark	...
105	Marshall Islands, Republic of	...	105	Kiribati	...	105	Equatorial Guinea	...
106	Micronesia, Federated States of	...	106	Kosovo, Republic of	...	106	Ethiopia	...
107	Mozambique	...	107	Latvia	...	107	France	...
108	Norway	...	108	Lebanon	...	108	Germany	...
109	Pakistan	...	109	Lithuania	...	109	Greece	...
110	Paraguay	...	110	Malaysia	...	110	Ireland	...
111	Poland	...	111	Mozambique	...	111	Italy	...
112	Portugal	...	112	Norway	...	112	Kosovo, Republic of	...
113	Romania	...	113	Pakistan	...	113	Latvia	...
114	Samoa	...	114	Poland	...	114	Malaysia	...
115	Serbia, Republic of	...	115	Portugal	...	115	Norway	...
116	Seychelles	...	116	Romania	...	116	Pakistan	...
117	Singapore	...	117	Samoa	...	117	Poland	...
118	Slovak Republic	...	118	Singapore	...	118	Portugal	...
119	Slovenia	...	119	Slovak Republic	...	119	Romania	...
120	Solomon Islands	...	120	Slovenia	...	120	Slovak Republic	...
121	South Africa	...	121	Solomon Islands	...	121	Slovenia	...
122	Turkey	...	122	South Africa	...	122	South Africa	...
123	United Arab Emirates	...	123	Turkey	...	123	Syrian Arab Republic	...
124	United States	...	124	United Arab Emirates	...	124	Turkey	...
125	Vietnam	...	125	United States	...	125	United States	...
126	West Bank and Gaza	...	126	Vietnam	...	126	Vietnam	...
127	Yemen, Republic of	...	127	Yemen, Republic of	...	127	Yemen, Republic of	...