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

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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.

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I. INTRODUCTION

Securing stable domestic resources is part of the multiple objectives of tax policy. 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.

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 (Suyderhoud, 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. 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. 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.

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 127 countries 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

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).
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 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). 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. 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:

\[ T = \frac{1}{n} \sum_{i=1}^{n} \frac{t_{axi}}{\mu} \times \log \left( \frac{t_{axi}}{\mu} \right) \]  

\( T \) refers to the Theil index; \( t_{axi} \) to a specific direct or indirect tax subcomponent (corporate income tax, personal income tax, or taxes on goods and services), and \( \mu = \frac{1}{n} \sum_{i=1}^{n} t_{axi} \) 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.

| Rank | Country          | RDI  | Rank | Country          | RDI  | Rank | Country          | RDI  |
|------|------------------|------|------|------------------|------|------|------------------|------|
| 1    | Japan            | 0.053| 1    | Japan            | 0.056| 1    | Japan            | 0.057|
| 2    | France           | 0.160| 2    | United Kingdom   | 0.149| 2    | France           | 0.153|
| 3    | United Kingdom   | 0.164| 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     | 1.403| 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            | 1.210| 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.

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15 The full RDI-based country ranking can be found in Annex 4.
Figure 2. RDI by Region, Income Group, Fragility Status and Size (Average Values)

2.a. RDI by region

2.b. RDI by income group

2.c. RDI by fragility criteria & country size

2.d. RDI by resource-rich criteria

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 Gulf 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 shrank 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](image)

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). 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

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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**

5a. RDI and Tax Revenue

5b. RDI and Tax Revenue Volatility

5c. RDI and GDP Growth Volatility

5d. RDI and Spending Volatility

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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.

\[ RDI_{it} = \alpha + \beta RDI_{i,t-1} + \gamma X_{i,t-1} + \lambda K_{i,t-1} + \sum_{k=1}^{K} \phi_k Z_{k,i,t-1} + \eta_i + \epsilon_{it} \]  

Revenue diversification index (RDI) is the dependent variable, and three sets of potential covariates are considered: (i) factors capturing the country economic structure \((X_d)\); (ii) variables reflecting the macroeconomic (domestic and external) environment \((K_d)\); and (iii) factors featuring countries’ political and institutional context along with their development status \((Z_{kd})\). 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. 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. 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).

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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 |
|--------------------------------------------------------|--------------------------------------------|
| RDI_{(t-1)}                                           | (1) (2) (3) (4) (5) (6) (7) (8) (9)       |
| 0.679***                                              | 0.604***                                   |
| 0.599***                                              | 0.737***                                   |
| 0.683***                                              | 0.598***                                   |
| 0.608***                                              | 0.619***                                   |
| 0.610***                                              |                                             |
| Log real GDP, pC(t-1)                                 | (0.061)                                    |
| -0.460*                                               | (0.019)                                    |
| -0.395***                                             | (0.018)                                    |
| -0.450***                                             | (0.030)                                    |
| -0.274*                                               | (0.0020)                                   |
| -0.539**                                              | (0.015)                                    |
| -0.533**                                              | (0.019)                                    |
| -0.336**                                              | (0.018)                                    |
| -0.308**                                              | (0.011)                                    |
| Financial development, pC(t-1)                        | (0.255)                                    |
| 0.025*                                                 | (0.144)                                    |
| 0.028***                                              | (0.143)                                    |
| 0.017                                                 | (0.165)                                    |
| 0.037***                                              | (0.249)                                    |
| 0.034***                                              | (0.133)                                    |
| 0.022**                                               | (0.137)                                    |
| 0.021**                                               | (0.148)                                    |
| Financial development, pC^{2}(t-1)                    | (0.014)                                    |
| -0.381***                                             | (0.009)                                    |
| -0.349***                                             | (0.009)                                    |
| 0.079                                                 | (0.011)                                    |
| -0.653***                                             | (0.016)                                    |
| -0.523***                                             | (0.008)                                    |
| -0.371***                                             | (0.009)                                    |
| -0.492***                                             | (0.009)                                    |
| Financial development, pC^{3}(t-1)                    | (0.009)                                    |
| 0.018**                                               | (0.009)                                    |
| 0.013*                                                | (0.008)                                    |
| 0.008                                                 | (0.005)                                    |
| 0.007                                                 | (0.023)                                    |
| 0.012                                                 | (0.009)                                    |
| 0.015*                                                | (0.009)                                    |
| 0.023*                                                | (0.013)                                    |
| Natural resource rents, pC(t-1)                       |                                             |
| 0.272**                                               | (0.125)                                    |
| Natural resource rents, pC^{2}(t-1)                   |                                             |
| 0.011**                                               | (0.005)                                    |
| Natural resource rents, pC^{3}(t-1)                   |                                             |
| Log net ODA received, pC(t-1)                         |                                             |
| Log of informal share, pC(t-1)                        |                                             |
| Log of inflation rate, pC(t-1)                        |                                             |
| De jure globalization index, pC(t-1)                  |                                             |
| -0.018                                                | (0.061)                                    |
| -0.037                                                | (0.036)                                    |
| IMF program dummy                                     |                                             |
| 2.163*                                                | (1.111)                                    |
| 1.734***                                              | (0.594)                                    |
| 1.965***                                              | (0.594)                                    |
| 1.106*                                                | (1.641)                                    |
| 1.742*                                                | (0.911)                                    |
| 2.335***                                              | (0.553)                                    |
| 1.572**                                               | (0.614)                                    |
| 1.441**                                               | (0.613)                                    |
| 3.387**                                               | (0.351)                                    |
| Constant                                              |                                             |
| 1218                                                  | (1141)                                     |
| 1141                                                  | (1141)                                     |
| 639                                                   | (943)                                      |
| 943                                                   | (1061)                                     |
| 1141                                                  | (960)                                      |
| 1125                                                  |                                             |
| Countries                                             |                                             |
| 104                                                   | (97)                                       |
| 97                                                    | (97)                                       |
| 65                                                    | (65)                                       |
| 83                                                    | (83)                                       |
| 97                                                    | (97)                                       |
| 79                                                    | (79)                                       |
| 94                                                    | (94)                                       |
| AR(1)                                                 |                                             |
| 0.06                                                  |                                             |
| 0.09                                                  |                                             |
| 0.09                                                  |                                             |
| 0.00                                                  |                                             |
| 0.00                                                  |                                             |
| 0.08                                                  |                                             |
| 0.10                                                  |                                             |
| 0.09                                                  |                                             |
| 0.09                                                  |                                             |
| 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                                                   |                                             |
| Region FE                                             |                                             |
| 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 measures 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 exogenous.

**Macroeconomic conditions play a role in countries’ tax revenue diversification patterns.**

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...
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 (1) | Advanced vs EME/LIDC (2) | Resource rich (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, 2000-2015

| Political and institutional factors | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
|------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| **Dependent variable:** Revenue diversification index (RDI)** | 0.610*** | 0.627*** | 0.605*** | 0.624*** | 0.598*** | 0.593*** | 0.597*** | 0.599*** | 0.580*** | 0.643*** |
| RDI**(t-1)** | 0.610*** | 0.627*** | 0.605*** | 0.624*** | 0.598*** | 0.593*** | 0.597*** | 0.599*** | 0.580*** | 0.643*** |
| Log real GDP, **p**(t-1)** | -0.606*** | -0.701*** | -0.779*** | -0.968*** | -0.721*** | -1.062*** | -0.324** | -0.550*** | -0.432** | -0.490** |
| Log real GDP, **p** squared**(t-1)** | 0.040*** | 0.044*** | 0.050*** | 0.062*** | 0.046*** | 0.071*** | 0.022** | 0.016*** | 0.029** | 0.034*** |
| Financial development**(t-1)** | -0.725*** | -0.521*** | -0.668*** | -0.600*** | -0.614*** | -0.718*** | -0.195 | -0.363*** | -0.183 | -0.504*** |
| Trade openness**(t-1)** | -0.071** | 0.01 | -0.051** | -0.048** | -0.061** | -0.034 | 0.009 | -0.01 | -0.007 | -0.049 |
| 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 |
| Democracy**(t-1)** | -0.005* | (0.003) | -0.026* | (0.012) | -0.149*** | (0.025) | -0.003** | (0.001) | -0.011*** | (0.004) |
| Government fractionalization**(t-1)** | -0.062*** | (0.020) | -0.150*** | (0.019) | -0.047** | (0.027) | -0.062*** | (0.003) | -0.104*** | (0.022) |
| Voice and accountability**(t-1)** | -0.027*** | (0.010) | -0.022*** | (0.019) | -0.027*** | (0.020) | -0.027*** | (0.020) | -0.027*** | (0.020) |
| Control of corruption**(t-1)** | 2.674*** | 2.978*** | 3.350*** | 4.359*** | 3.082*** | 4.542*** | 1.302*** | 2.235*** | 1.742*** | 2.089*** |
| Constant | 0.670*** | 0.506*** | 0.363*** | 0.379*** | 0.356*** | 0.455*** | 0.457*** | 0.463*** | 0.747*** | 0.859*** |

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). 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.

\[ Y_{it} = \alpha + \beta Y_{it-1} + \gamma RDI_{it-1} + \sum_{k=1}^{K} \varphi_k Z_{k, it-1} + \eta_t + \pi_t + \epsilon_{it} \]  

(3)  

RDI\textsubscript{it}, which stands for tax revenue diversification, is the explanatory variable of interest. We focus on two outcome variables (\(Y_t\)). 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 \(Z\textsubscript{k, it}\) 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. \(\eta_t\) captures the country-specific and time-invariant effects, and \(\epsilon\textsubscript{it}\) 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

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\(^{21}\) 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 |
|------------------------------------------|---------------------------------|---------------------|-------------------------------------|
| Constant (-1)                            | 0.866*** (0.933***)             | 0.925***            | 0.932*** (0.922***)                 |
| RDI (0.013)                              | -0.016*** (-0.025***)           | -0.016***           | -0.017** (-0.021*** -0.028*** -0.018** -0.028*** -0.015* -0.012** |
| Real GDP_pc (-0.010)                     | 0.177*** (0.073)                | 0.151***            | 0.172*** (0.185*** 0.234*** 0.359** 0.184** 0.094** 0.043** |
| Real GDP_pc squared (-0.010)             | 0.010*** (-0.005** -0.009*** -0.010*** -0.006** -0.006** -0.006** -0.011*** -0.014*** -0.003** -0.001**-0.008*** |
| Trade openness (-0.003)                  | 0.002 (0.000)                   | 0.001 (0.000)       | 0.002 (0.000) 0.019* 0.001 0.003 0.001 0.001 0.001 0.001 |
| Internal conflicts (-0.003)              | -0.102*** (0.024)               |                     |                                     |
| Agricultural VA (-0.018** -0.008**)      |                                 |                     |                                     |
| Natural res. rents (-0.009)              |                                 |                     |                                     |
| Official ER (-0.004)**                   | 0.001*** (0.000)                |                     |                                     |
| Public Debt/GDP (-0.004)                 | 0.028*** (0.006)                |                     |                                     |
| FDI net inflows (-0.001)                 | 0.040*** (0.007)                |                     |                                     |
| Quality of bureaucracy (-0.002** -0.016**) | 0.002** (0.001)                |                     |                                     |

* , ** , and *** denote statistical significance at 10 percent, 5 percent and 1 percent level, respectively. Standard errors are reported in brackets.

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.

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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_{t-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_{t-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}_{t-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_{t-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_{t-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_{t-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_{t-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 concen_{t-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) | (0.055) | (0.060) | (0.128) |
| Financial development_{t-1} | 0.222 | 0.394 | -4.655*** | 3.401** | -0.401 | 6.704*** | 5.489*** | 6.029*** | 5.796*** | -4.907*** |
| (1.527) | (0.933) | (0.925) | (1.654) | (0.889) | (1.457) | (0.756) | (0.558) | (0.855) | (2.146) |
| Polity_{2}_{t-1} | -0.035*** | (0.013) |
| Corrup._{t-1} | 0.096** | (0.048) |
| Government stability_{t-1} | -0.473*** | (0.067) |
| Polarization_{t-1} | 0.129* | (0.074) |
| Voice and accountability_{t-1} | -0.961*** | (0.167) |
| Regulatory qual._{t-1} | -0.893*** | (0.113) |
| Rule of law_{t-1} | -0.607*** | (0.122) |
| Gov. effectiveness_{t-1} | -0.312*** | (0.107) |
| Fiscal rules_{t-1} | -0.663*** | (0.215) |

* , **, 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.
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## Annex 1. Sample and Country Groups

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

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 per capita (Real GDP_pc) | Real GDP per capita | IMF’s World Economic Outlook (WEO) database |
| Square of real GDP per capita (Real GDP_pc squared) | Square of real GDP per capita | Authors’ calculations |
| Index of financial development (Financial development) | Index of financial development | Svyridzenka (2016) |
| Sum of imports and exports over GDP (Trade openness) | Sum of imports and exports over GDP | World Bank’s World Development Indicators |
| Theil index of exports concentration (Exports concentration index) | Theil index of exports concentration | IMF datasets |
| Natural resource rents in percentage of GDP (Natural resource rents) | Natural resource rents in percentage of GDP | World Bank’s World Development Indicators |
| Net Official Development Assistance received per capita (Net ODA received per capita) | Net Official Development Assistance received per capita | World Bank’s World Development Indicators |
| Share of the informal sector in the economy (percentage) (Informal share) | Share of the informal sector in the economy (percentage) | Medina, Jonelis and Cangul (2017) |
| Consumer price index growth rate (in percentage) (Inflation rate / Informaty) | Consumer price index growth rate (in percentage) | IMF’s World Economic Outlook (WEO) database |
| It measures the extent of investment restrictions, capital account openness and international investment agreements. (De jure globalization index) | It measures the extent of investment restrictions, capital account openness and international investment agreements. | Gygli et al. (2019) |
| Rate of real GDP growth (GDP growth) | Rate of real GDP growth | IMF’s World Economic Outlook (WEO) database |
| Human capital index (Human capital index) | Human capital index, based on years of schooling and returns to education | Penn World Tables 9.1 |
| Binary variable taking the value of 1 if the country has an IMF program and 0 otherwise (IMF program dummy) | Binary variable taking the value of 1 if the country has an IMF program and 0 otherwise | IMF datasets |
| Degree of democracy. The polity 2 score ranges from -10 to +10, with higher value representing more democracy. (Democracy) | Degree of democracy. The polity 2 score ranges from -10 to +10, with higher value representing more democracy. | Marshall and Gurr (2018) |
| It measures the maximum polarization between the executive party and the four principle parties of the legislature. (Political polarization) | It measures the maximum polarization between the executive party and the four principle parties of the legislature. | Database of Political Institutions |
| It measures the probability that two deputies picked at random from among the government parties will be of different parties. (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 |
| It measures the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means. (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 |
| It measures the largest party orientation with respect to economic policy. (Largest gov. party orient.) | It measures the largest party orientation with respect to economic policy. | Database of Political Institutions |
| It measures the institutional strength and quality of the bureaucracy (Quality of bureaucracy) | It measures the institutional strength and quality of the bureaucracy | International Country Risk Guide (ICRG) |
| It measures the extent to which agents have confidence in and abide by the rules of society (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 |
| 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 (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 |
| 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 (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 |
| It represents the extent to which public power is exercised for private gain, including petty and grand forms of corruption. (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 valued added (in percentage of GDP) (Agriculture VA) | Agriculture valued added (in percentage of GDP) | World Bank’s World Development Indicators |
| Standard deviation of GDP growth (using rolling window method) (Growth volatility) | Standard deviation of GDP growth (using rolling window method) | Authors’ calculations |
| It measures the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. (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 |
| Measure of the degree of democracy/autocracy ranging from +10 (strongly democratic) to 110 (strongly autocratic) (Polity 2) | Measure of the degree of democracy/autocracy ranging from +10 (strongly democratic) to 110 (strongly autocratic) | Marshall and Gurr (2018) |
| Assessment of countries’s political stability (Political risk) | Assessment of countries’s political stability | International Country Risk Guide (ICRG) |
| Assessment of political violence in the country and its actual or potential impact on governance (Internal conflicts) | Assessment of political violence in the country and its actual or potential impact on governance | International Country Risk Guide (ICRG) |
| Dummy: 1 if numerical fiscal rule in place, 0 otherwise (Fiscal rules) | Dummy: 1 if numerical fiscal rule in place, 0 otherwise | IMF Fiscal Rules Dataset |
| Direct investment equity flows in the reporting economy. It is the sum of equity capital, reinvestment of earnings, and other capital. (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 |
| General government total debt, percent of fiscal year GDP (Public debt (% GDP)) | General government total debt, percent of fiscal year GDP | World Bank’s Worldwide Governance Indicators |
| Overall fiscal balance percentage of GDP (Overall fiscal balance) | Overall fiscal balance percentage of GDP | IMF’s World Economic Outlook (WEO) database |
| Official exchange rate (LCU per US$, period average) (Exchange rate) | Official exchange rate (LCU per US$, 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                        | 2000-2001   |
| 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

| Rank | 2000-2004 | 2005-2009 | 2010-2015 |
|------|------------|------------|------------|
| 1    | Japan      | Japan      | Japan      |
| 2    | France     | United Kingdom | France     |
| 3    | United Kingdom | United States | United Kingdom |
| 4    | United States | Switzerland | United States |
| 5    | South Africa | South Africa | South Africa |
| 6    | Switzerland | Switzerland | Switzerland |
| 7    | Norway     | Israel     | Singapore  |
| 8    | Australia  | Australia  | Australia  |
| 9    | Israel     | Norway     | Norway     |
| 10   | Spain      | Spain      | Korea, Republic of |
| 11   | Luxembourg | Belgium    | Israël     |
| 12   | Belgium    | Cyprus     | Belgium    |
| 13   | Netherlands | Luxembourg | Spain      |
| 14   | Ukraine    | Korea, Republic of | Luxembourg |
| 15   | Ireland    | Ireland    | Ireland    |
| 16   | Cyprus     | Ireland    | Cyprus     |
| 17   | Oman       | Barbados   | Iceland    |
| 18   | Finland    | Germany    | Netherlands |
| 19   | Italy      | Poland     | Italy      |
| 20   | Greece     | Italy      | Malta      |
| 21   | Yemen, Republic of | Finland | Germany |
| 22   | Latvia     | Ukrainie   | Georgia    |
| 23   | Poland     | Oman       | Greece     |
| 24   | Barbados   | Greece     | Portugal   |
| 25   | Czech Republic | Iceland | Oman      |
| 26   | Bhutan     | Indonesia  | India      |
| 27   | Germany    | Latvia     | Poland     |
| 28   | Denmark    | Malta      | Kenya      |
| 29   | Iceland    | Czech Republic | Finland |
| 30   | Malaysia   | India      | Azerbaijan, Republic of |
| 31   | Portugal   | Denmark    | Barbados   |
| 32   | Malta      | Azerbaijan, Republic of | Indonesia |
| 33   | Montenegro | Yemin, Republic of | Slovakia, Republic |
| 34   | Romania    | Portugal   | Malaysia   |
| 35   | Austria    | Lithuania  | Latvia     |
| 36   | Philippines | Jamaica | Latvia    |
| 37   | Morocco    | Montserrat | Denmark    |
| 38   | Egypt      | Slovenia   | Egypt      |
| 39   | Slovak Republic | Thailand | Montserrat |
| 40   | Canada     | Egypt      | Malaysia   |
| 41   | Namibia    | Romania    | Tunisia    |
| 42   | Georgia    | Austria    | Ukraine    |
| 43   | India      | Slovak Republic | Peru    |
| 44   | Slovenia   | Philippines | Honduras  |
| 45   | Jamaica    | Canada     | Czech Republic |
| 46   | Sweden     | Malaysia   | Jamaica    |
| 47   | Hungary    | Malawi     | Israel     |
| 48   | São Tomé and Príncipe | Georgia | Thailand |
| 49   | Thailand   | Tunisia    | Austria    |
| 50   | Lithuania  | Kenya      | Namibia    |
| 51   | Bulgaria   | Morocco    | Romania    |
| 52   | Honduras   | Hungary    | Yemin, Republic of |
| 53   | Estonia    | Peru       | Costa Rica |
| 54   | Bahrain, Kingdom of | Honduras | Canada    |
| 55   | San Marino | Sweden     | Congo, Republic of |
| 56   | St. Kitts and Nevis | El Salvador | Morocco |
| 57   | Tunisia    | Brazil     | Sweden     |
| 58   | St. Vincent and the Grenadines | Namibia | Solomon Islands |
| 59   | Peru       | Estonia    | Sierra Leone |
| 60   | El Salvador | Congo, Republic of | Micronesia, Federated States of |
| 61   | Swaziland  | Turkey     | Mozambique |
| 62   | Dominica   | Costa Rica | China, P.R. Mainland |
| 63   | Vietnam    | Bhutan     | Bhutan     |
| 64   | Ghana      | Bulgaria   | Ghana     |

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

|   | Country                        | RDI 1990 | Country                        | RDI 1990 | Country                        | RDI 1990 | Country                        | RDI 1990 | Country                        | RDI 1990 |
|---|--------------------------------|----------|--------------------------------|----------|--------------------------------|----------|--------------------------------|----------|--------------------------------|----------|
| 65| Sierra Leone                   | 0.595    | 66                              | Benin    | 0.607                          |          | 67                              | Moldova  | 0.614                          |          |
| 68| St. Lucia                      | 0.618    | 69                              | Grenada  | 0.649                          |          | 70                              | Côte d'Ivoire | 0.649                    |          |
| 71| Afghanistan                    | 0.656    | 72                              | Armenia, Republic of | 0.593    |          | 73                              | Colombia | 0.665                          |          |
| 74| Cyprus                          | 0.684    | 75                              | Congo, Democratic Republic of | 0.688   |          | 76                              | Angola   | 0.693                          |          |
| 77| Syria                           | 0.700    | 78                              | Ethiopia | 0.700                          |          | 79                              | Dominican Republic | 0.702       |          |
| 81| Croatia                        | 0.720    | 82                              | Congo, Republic of | 0.732    |          | 83                              | Togo      | 0.751                          |          |
| 85| Mauritius                      | 0.783    | 86                              | Kenya    | 0.799                          |          | 87                              | Uganda   | 0.814                          |          |
| 88| Jordan                          | 0.816    | 89                              | Algeria  | 0.818                          |          | 90                              | Sri Lanka | 0.822                          |          |
| 91| Bangladesh                     | 0.824    | 92                              | Guatemala | 0.875                          |          | 93                              | Antigua and Barbuda | 0.884      |          |
| 95| Bolivia                         | 1.040    | 96                              | Bahamas, The | 1.203                         |          | 97                              | Maldives | 1.213                          |          |
| 98| Qatar                           | 1.215    | 100                             | Azerbaijan, Republic of | ...      |          | 101                             | Botswana | 1.010                          |          |
| 104| Burundi                        | 1.04     | 105                             | Cabo Verde | 1.05                          |          | 106                             | China, P.R.: Mainland | 1.06      |          |
| 110| Kiribati                       | 1.10     | 111                             | Korea, Republic of | ...      |          | 112                             | Kosovo, Republic of | 1.11      |          |
| 117| Marshall Islands, Republic of | ...      | 118                             | Mozambique | 1.18                         |          | 119                             | Paraguay | ...                            |          |
| 122| Samoa                          | 1.20     | 123                             | Seychelles | 1.22                          |          | 124                             | Solomon Islands | 1.24       |          |
| 127| United Arab Emirates           | ...      | 128                             | Turkey   | 1.25                          |          | 129                             | United Arab Emirates | ...    |          |

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## Annex 5. Alternative estimates

*Accounting for shift in value added across sectors*

| Dependent variable: Revenue diversification index (RDI) | Baseline (1) | Controlling for VA share of services (2) | (3) | (4) |
|--------------------------------------------------------|--------------|----------------------------------------|-----|-----|
| RDI<sub>(t-1)</sub>                                    | 0.611***     | 0.478***                               | 0.459*** | 0.453*** |
| (0.011)                                                | (0.024)      | (0.022)                                | (0.023) |
| Log real GDP<sub>(t-1)</sub>_pc                         | -0.6170***   | -0.8073***                             | -0.7172*** | -0.7804*** |
| (0.080)                                                | (0.123)      | (0.128)                                | (0.135) |
| Log real GDP<sub>(t-1)</sub>_pc_sqr                     | 0.038***     | 0.051***                               | 0.0442*** | 0.0487*** |
| (0.005)                                                | (0.008)      | (0.008)                                | (0.009) |
| Financial development<sub>(t-1)</sub>                  | -0.3958***   | -0.6439***                             | -0.5385*** | -0.6052*** |
| (0.108)                                                | (0.133)      | (0.138)                                | (0.139) |
| Trade openness<sub>(t-1)</sub>                         | -0.0318*     | -0.0212                                | -0.0257   | -0.0116  |
| (0.019)                                                | (0.026)      | (0.026)                                | (0.028) |
| Export concentration index<sub>(t-1)</sub>             | 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     |
| (0.000)                                                | (0.000)      | (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       |

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| Rank | Country                  | 2000-2004 | Country      | 2005-2009 | Country      | 2010-2015 |
|------|--------------------------|-----------|--------------|-----------|--------------|-----------|
| 1    | Japan                    | 0.279     | Japan        | 0.276     | Japan        | 0.277     |
| 2    | France                   | 0.326     | United Kingdom| 0.316    | France       | 0.322     |
| 3    | Norway                   | 0.328     | France       | 0.323     | South Africa | 0.325     |
| 4    | United Kingdom           | 0.329     | Norway       | 0.322     | Norway       | 0.326     |
| 5    | South Africa             | 0.329     | South Africa | 0.323     | United Kingdom| 0.332     |
| 6    | Switzerland              | 0.341     | Australia    | 0.331     | Switzerland  | 0.335     |
| 7    | Oman                     | 0.342     | United States| 0.334     | Australia    | 0.335     |
| 8    | Australia                | 0.355     | Switzerland  | 0.335     | Singapore    | 0.342     |
| 9    | Luxembourg               | 0.351     | Israel       | 0.343     | United States| 0.346     |
| 10   | United States            | 0.351     | Spain        | 0.347     | Belgium      | 0.355     |
| 11   | Israel                   | 0.356     | Belgium      | 0.356     | Luxembourg   | 0.356     |
| 12   | Yemen, Republic of       | 0.364     | Luxembourg   | 0.357     | Spain        | 0.362     |
| 13   | Belgium                  | 0.364     | Oman         | 0.368     | Israel       | 0.363     |
| 14   | Spain                    | 0.366     | Ireland      | 0.379     | Korea, Republic of | 0.364     |
| 15   | Ukraine                  | 0.369     | Cyprus       | 0.381     | Ireland      | 0.368     |
| 16   | Ireland                  | 0.373     | Netherlands  | 0.384     | Oman         | 0.371     |
| 17   | Finland                  | 0.377     | India        | 0.385     | India        | 0.372     |
| 18   | Bhutan                   | 0.379     | Germany      | 0.389     | Iceland      | 0.382     |
| 19   | Netherlands              | 0.379     | Korea, Republic of | 0.390     | Malta        | 0.383     |
| 20   | Italy                    | 0.392     | Finland      | 0.391     | Cyprus       | 0.385     |
| 21   | Malaysia                 | 0.395     | Yumen, Republic of | 0.394     | Kenya        | 0.389     |
| 22   | Cyprus                   | 0.401     | Italy        | 0.396     | Netherlands  | 0.390     |
| 23   | Germany                  | 0.404     | Iceland      | 0.403     | Germany      | 0.393     |
| 24   | Czech Republic           | 0.405     | Indonesia    | 0.403     | Italy        | 0.396     |
| 25   | Iceland                  | 0.414     | Malta        | 0.406     | Malawi       | 0.407     |
| 26   | Austria                  | 0.416     | Czech Republic| 0.406     | Finland      | 0.408     |
| 27   | Latvia                   | 0.419     | Ukraine      | 0.408     | Malaysia     | 0.409     |
| 28   | Denmark                  | 0.425     | Jamaica      | 0.414     | Philippines  | 0.410     |
| 29   | Greece                   | 0.429     | Austria      | 0.417     | Portugal     | 0.416     |
| 30   | Malta                    | 0.430     | Barbados     | 0.418     | Georgia      | 0.417     |
| 31   | Montserrat               | 0.431     | Latvia       | 0.419     | Tunisia      | 0.419     |
| 32   | Philippines              | 0.438     | Malaysia     | 0.420     | Indonesia    | 0.419     |
| 33   | Poland                   | 0.438     | Egypt        | 0.420     | Egypt        | 0.419     |
| 34   | Barbados                 | 0.438     | Azerbaijan, Republic of | 0.421 | Austria | 0.422 |
| 35   | Namibia                  | 0.441     | Denmark      | 0.423     | Azerbaijan, Republic of | 0.423 |
| 36   | Portugal                 | 0.442     | Lithuania    | 0.425     | Jamaica      | 0.428     |
| 37   | Jamaica                  | 0.448     | Montserrat   | 0.425     | Yemen, Republic of | 0.430 |
| 38   | Egypt                    | 0.449     | Poland       | 0.427     | Montserrat   | 0.431     |
| 39   | India                    | 0.450     | Philippines | 0.429     | Greece       | 0.431     |
| 40   | San Marino               | 0.450     | Thailand     | 0.432     | Peru         | 0.435     |
| 41   | São Tomé and Principe    | 0.460     | Slovenia     | 0.433     | Poland       | 0.439     |
| 42   | Lithuania                | 0.460     | Malawi       | 0.434     | Denmark      | 0.439     |
| 43   | Slovenia                 | 0.462     | Greece       | 0.434     | Bhutan       | 0.439     |
| 44   | Bahrain, Kingdom of      | 0.466     | Kenya        | 0.439     | Latvia       | 0.442     |
| 45   | Hungary                  | 0.467     | Tunisia      | 0.441     | Thailand     | 0.444     |
| 46   | Romania                  | 0.469     | Portugal     | 0.443     | Sierra Leone | 0.445 |
| 47   | Canada                   | 0.469     | Morocco      | 0.457     | Namibia      | 0.447     |
| 48   | Estonia                  | 0.478     | Hungary      | 0.459     | Czech Republic| 0.449 |
| 49   | Sweden                   | 0.475     | Peru         | 0.459     | Ukraine      | 0.452     |
| 50   | Morocco                  | 0.476     | Bhutan       | 0.459     | Slovak Republic| 0.452 |
| 51   | Slovak Republic          | 0.482     | Canada       | 0.462     | Micronesia, Federated States of | 0.457 |
| 52   | Thailand                 | 0.485     | Sweden       | 0.465     | Sweden       | 0.459     |
| 53   | Bulgaria                 | 0.498     | Slovak Republic| 0.468     | Barbados     | 0.460     |
| 54   | Vietnam                  | 0.504     | Romania      | 0.472     | Mozambique   | 0.462     |
| 55   | Georgia                  | 0.506     | Namibia      | 0.478     | Congo, Republic of | 0.462 |
| 56   | Syrian Arab Republic     | 0.507     | Estonia      | 0.482     | Algeria      | 0.464     |
| 57   | Tunisia                  | 0.515     | Georgia      | 0.484     | Canada       | 0.471     |
| 58   | Colombia                 | 0.512     | El Salvador  | 0.485     | Honduras     | 0.471     |
| 59   | St. Kitts and Nevis      | 0.533     | San Marino   | 0.490     | Morocco      | 0.476     |
| 60   | El Salvador              | 0.536     | Marshall Islands, Republic of | 0.491 | Solomon Islands | 0.477 |
| 61   | Honduras                 | 0.534     | Vietnam      | 0.494     | Ghana        | 0.477     |
| 62   | St. Vincent and the Grenadines | 0.537 | Honduras | 0.495 | Vietnam | 0.478 |
| 63   | Swaziland                | 0.539     | Congo, Republic of | 0.498 | Kiribati | 0.479 |
| 64   | Peru                     | 0.543     | Colombia     | 0.507     | Romania      | 0.488     |
| Rank | Country                  | HHI RDI |
|------|--------------------------|---------|
| 65   | Ghana                    | 0.553   |
| 66   | Sierra Leone             | 0.554   |
| 67   | Dominica                 | 0.561   |
| 68   | Pakistan                 | 0.573   |
| 69   | Benin                    | 0.587   |
| 70   | Angola                   | 0.5870  |
| 71   | St. Lucia                | 0.597   |
| 72   | Moldova                  | 0.599   |
| 73   | Lesotho                  | 0.606   |
| 74   | Côte d'Ivoire            | 0.611   |
| 75   | Ethiopia                 | 0.613   |
| 76   | Congo, Democratic Republic of | 0.618 |
| 77   | Kuwait                   | 0.619   |
| 78   | Grenada                  | 0.623   |
| 79   | Kenya                    | 0.633   |
| 80   | Armenia, Republic of      | 0.633   |
| 81   | Congo, Republic of       | 0.634   |
| 82   | Dominican Republic        | 0.637   |
| 83   | Croatia                  | 0.645   |
| 84   | Togo                     | 0.656   |
| 85   | Uganda                   | 0.662   |
| 86   | Nepal                    | 0.669   |
| 87   | Algeria                  | 0.701   |
| 88   | Mauritius                | 0.706   |
| 89   | Jordan                   | 0.706   |
| 90   | Bangladesh               | 0.714   |
| 91   | Guatemala                | 0.717   |
| 92   | Antigua and Barbuda      | 0.727   |
| 93   | Sri Lanka                | 0.728   |
| 94   | Bolivia                  | 0.806   |
| 95   | Cambodia                 | 0.819   |
| 96   | Bahamas, The             | 0.914   |
| 97   | Maldives                 | 0.928   |
| 98   | Qatar                    | 0.921   |
| 99   | Anguilla                 | 0.984   |
| 100  | Azerbaijan, Republic of   | 0.723   |
| 101  | Botswana                 | 0.724   |
| 102  | Brazil                   | 0.727   |
| 103  | Burkina Faso             | 0.838   |
| 104  | Burundi                  | 0.894   |
| 105  | Cabo Verde               | 0.915   |
| 106  | China, P.R.: Mainland    | 0.924   |
| 107  | Costa Rica               | 0.925   |
| 108  | Equatorial Guinea        | 0.926   |
| 109  | Indonesia                | 0.927   |
| 110  | Kiribati                 | 0.928   |
| 111  | Korea, Republic of       | 0.929   |
| 112  | Kosovo, Republic of      | 0.930   |
| 113  | Kyrgyz Republic          | 0.931   |
| 114  | People's Democratic Republic | 0.932 |
| 115  | Lebanon                  | 0.933   |
| 116  | Malawi                   | 0.934   |
| 117  | Marshall Islands, Republic of | 0.935 |
| 118  | Micronesia, Federated States of | 0.936 |
| 119  | Mozambique               | 0.937   |
| 120  | Nicaragua                | 0.938   |
| 121  | Nigeria                  | 0.939   |
| 122  | Palau                    | 0.940   |
| 123  | Paraguay                 | 0.941   |
| 124  | Samoa                    | 0.942   |
| 125  | Serbia, Republic of      | 0.943   |
| 126  | Seychelles               | 0.944   |
| 127  | Singapore                | 0.945   |

Annex 6. Full HHI RDI-based country ranking (Cont’d)
## Annex 7. Adjusted (accounting for non-tax revenue) RDI-based country ranking

| Rank | 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 0.247 | 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 | Eritrea 0.482 |
| 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 Principe 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 0.679 | 49 | São Tomé and Principe 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 |
| Rank | Country                          | RDI | GDP (PPS) | Per Capita GDP (PPS) |
|------|----------------------------------|-----|-----------|----------------------|
| 65   | Maldives                         | 1.335 | 0.784    | 65 Marshall Islands, Republic of 0.633 |
| 66   | Bahrain, Kingdom of              | 1.340 | 0.786    | 66 St. Lucia 0.661 |
| 67   | Qatar                            | 1.379 | 0.792    | 67 Jordan 0.679 |
| 68   | Oman                             | 1.666 | 0.812    | 68 Grenada 0.693 |
| 69   | Anguilla                         | 1.779 | 0.814    | 69 Nepal 0.694 |
| 70   | Kuwait                           | 1.846 | 0.823    | 70 Moldova 0.694 |
| 71   | Bahamas, The                     | 1.888 | 0.888    | 71 Cabo Verde 0.694 |
| 72   | Australia                        | 1.982 | 0.976    | 72 Dominican Republic 0.709 |
| 73   | Azerbaijan, Republic of          | 2.001 | 0.901    | 73 Burundi 0.732 |
| 74   | Benin                            | 2.077 | 0.930    | 74 Antigua and Barbuda 0.732 |
| 75   | Bolivia                          | 2.946 | 0.946    | 75 Kyrgyz Republic 0.738 |
| 76   | Botswana                         | 3.023 | 0.993    | 76 Guatemala 0.779 |
| 77   | Brazil                           | 3.098 | 1.003    | 77 Latvia 0.819 |
| 78   | Bulgaria                         | 3.185 | 1.003    | 78 Maldives 0.910 |
| 79   | Burkina Faso                     | 3.207 | 1.013    | 79 Micronesia, Federated States of 0.839 |
| 80   | Burundi                          | 3.234 | 1.022    | 80 Cambodia 0.894 |
| 81   | Cabo Verde                       | 3.234 | 1.022    | 81 Sri Lanka 0.898 |
| 82   | Canada                           | 3.234 | 1.022    | 82 Qatar 0.910 |
| 83   | China, P.R.: Mainland            | 3.234 | 1.022    | 83 Maldives 0.910 |
| 84   | Costa Rica                       | 3.234 | 1.022    | 84 Botswana 0.976 |
| 85   | Cyprus                           | 3.234 | 1.022    | 85 Cambodia 0.894 |
| 86   | Côte d'Ivoire                    | 3.234 | 1.022    | 86 Cambodia 0.894 |
| 87   | Denmark                          | 3.234 | 1.022    | 87 Cambodia 0.894 |
| 88   | Equatorial Guinea                | 3.234 | 1.022    | 88 Cambodia 0.894 |
| 89   | Ethiopia                         | 3.234 | 1.022    | 89 Cambodia 0.894 |
| 90   | France                           | 3.234 | 1.022    | 90 Cambodia 0.894 |
| 91   | Germany                          | 3.234 | 1.022    | 91 Cambodia 0.894 |
| 92   | Greece                           | 3.234 | 1.022    | 92 Cambodia 0.894 |
| 93   | Indonesia                        | 3.234 | 1.022    | 93 Cambodia 0.894 |
| 94   | Ireland                          | 3.234 | 1.022    | 94 Kazakhstan 0.894 |
| 95   | Italy                            | 3.234 | 1.022    | 95 Kazakhstan 0.894 |
| 96   | Kiribati                         | 3.234 | 1.022    | 96 Kazakhstan 0.894 |
| 97   | Korea, Republic of               | 3.234 | 1.022    | 97 Kazakhstan 0.894 |
| 98   | Kosovo, Republic of              | 3.234 | 1.022    | 98 Kazakhstan 0.894 |
| 99   | Kyrgyz Republic                  | 3.234 | 1.022    | 99 Kazakhstan 0.894 |
| 100  | Latvia                           | 3.234 | 1.022    | 100 Kazakhstan 0.894 |
| 101  | Lebanon                          | 3.234 | 1.022    | 101 Kazakhstan 0.894 |
| 102  | Lithuania                        | 3.234 | 1.022    | 102 Kazakhstan 0.894 |
| 103  | Malawi                           | 3.234 | 1.022    | 103 Kazakhstan 0.894 |
| 104  | Malaysia                         | 3.234 | 1.022    | 104 Kazakhstan 0.894 |
| 105  | Marshall Islands, Republic of    | 3.234 | 1.022    | 105 Kazakhstan 0.894 |
| 106  | Micronesia, Federated States of  | 3.234 | 1.022    | 106 Marshall Islands, Republic of 0.894 |
| 107  | Mozambique                       | 3.234 | 1.022    | 107 Marshall Islands, Republic of 0.894 |
| 108  | Norway                           | 3.234 | 1.022    | 108 Marshall Islands, Republic of 0.894 |
| 109  | Pakistan                         | 3.234 | 1.022    | 109 Marshall Islands, Republic of 0.894 |
| 110  | Paraguay                         | 3.234 | 1.022    | 110 Marshall Islands, Republic of 0.894 |
| 111  | Poland                           | 3.234 | 1.022    | 111 Marshall Islands, Republic of 0.894 |
| 112  | Portugal                         | 3.234 | 1.022    | 112 Marshall Islands, Republic of 0.894 |
| 113  | Romania                          | 3.234 | 1.022    | 113 Marshall Islands, Republic of 0.894 |
| 114  | Samoa                            | 3.234 | 1.022    | 114 Marshall Islands, Republic of 0.894 |
| 115  | Serbia, Republic of              | 3.234 | 1.022    | 115 Marshall Islands, Republic of 0.894 |
| 116  | Seychelles                       | 3.234 | 1.022    | 116 Marshall Islands, Republic of 0.894 |
| 117  | Singapore                        | 3.234 | 1.022    | 117 Marshall Islands, Republic of 0.894 |
| 118  | Slovak Republic                  | 3.234 | 1.022    | 118 Marshall Islands, Republic of 0.894 |
| 119  | Slovenia                         | 3.234 | 1.022    | 119 Marshall Islands, Republic of 0.894 |
| 120  | Solomon Islands                  | 3.234 | 1.022    | 120 Marshall Islands, Republic of 0.894 |
| 121  | South Africa                     | 3.234 | 1.022    | 121 Marshall Islands, Republic of 0.894 |
| 122  | Turkey                           | 3.234 | 1.022    | 122 Marshall Islands, Republic of 0.894 |
| 123  | United Arab Emirates             | 3.234 | 1.022    | 123 Marshall Islands, Republic of 0.894 |
| 124  | United States                    | 3.234 | 1.022    | 124 Marshall Islands, Republic of 0.894 |
| 125  | Vietnam                          | 3.234 | 1.022    | 125 Marshall Islands, Republic of 0.894 |
| 126  | West Bank and Gaza               | 3.234 | 1.022    | 126 Marshall Islands, Republic of 0.894 |
| 127  | Yemen, Republic of               | 3.234 | 1.022    | 127 Marshall Islands, Republic of 0.894 |