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STAFF DISCUSSION NOTE

# Building Tax Capacity in Developing Countries

Juan Carlos Benitez, Mario Mansour, Miguel Pecho, and Charles Vellutini

SDN/2023/006

*IMF Staff Discussion Notes (SDNs) showcase policy-related analysis and research being developed by IMF staff members and are published to elicit comments and to encourage debate. The views expressed in Staff Discussion Notes are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.*

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**IMF Staff Discussion Notes**

Fiscal Affairs Department

**Building Tax Capacity in Developing Countries****Prepared by Juan Carlos Benitez, Mario Mansour, Miguel Pecho, and Charles Vellutini\***

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**ABSTRACT:** Tax capacity—the policy, institutional, and technical capabilities to collect tax revenue—is part of a deeper process of state building that is essential for achieving the sustainable development goals. This Staff Discussion Note shows that developing countries have made some progress in revenue mobilization during the past decades, but that much more is needed. It finds that a staggering 9 percentage-point increase in the tax-to-GDP ratio is feasible through a combination of tax system reform and institutional capacity building. Achieving this calls for a holistic and institution-based approach that focuses on improving policy, administration, and legal implementation of core taxes. The note offers practical lessons and guidance, based on IMF capacity-building experience in this area.

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## Acronyms/Glossary

AE	Advanced Economy
CD	Capacity Development
CIAT	Inter-American Center of Tax Administrations
CIT	Corporate Income Tax
EME	Emerging Market Economy
FAD	IMF Fiscal Affairs Department
FCS	Fragile and Conflict-Affected State
GDP	Gross Domestic Product
ICT	Information and Communication Technology
IMF	International Monetary Fund
IOTA	Intra-European Organisation of Tax Administration
ISORA	International Survey on Revenue Administration
LIDC	Low-Income Developing Countries
MTRS	Medium-Term Revenue Strategy
OECD	Organisation for Economic Cooperation and Development
PIT	Personal Income Tax
PPP	Purchasing Power Parity
SFA	Stochastic Frontier Analysis
SDG	Sustainable Development Goal
SSC	Social Security Contribution
TADAT	Tax Administration Diagnostic Assessment Tool
TPU	Tax Policy Unit
VAT	Value-Added Tax
WoRLD	World Revenue Longitudinal Database

## Executive Summary

**Building tax capacity—the policy, institutions, and technical capabilities to collect tax revenue—is central to the role of government in development.** The COVID-19 pandemic, the global energy crisis, and Russia’s war in Ukraine have served as reminders that economic resilience rests in no small part on domestic public revenue levers and the ability to fund suitable policy responses. Tax capacity is also integral to achieving the Sustainable Development Goals (SDGs), addressing climate change, and ensuring debt sustainability. Estimates suggest that additional average annual spending of up to 16 percent of GDP is needed in low-income developing countries (LIDCs) to reach the SDGs by 2030.

**Despite progress, there is a large unmet tax potential in LIDCs.** Tax revenue has progressed in LIDCs, with the average tax-to-GDP ratios increasing by about 3.5 percentage points since the early 1990s, to 13.8 percent in 2020. Country experiences vary, and the sustainability of revenue gains remains fragile in the face of shocks. New empirical evidence in this paper suggests that significant further increase is possible. Achieving this goal will require firm commitment to building better institutions that govern the tax system and manage tax system reform and improving the design of core taxes.

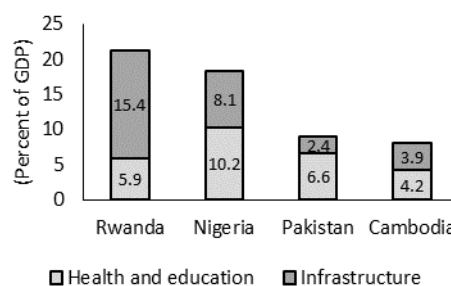
**This note provides practical lessons and guidance on how to improve tax capacity, with emphasis on LIDCs, building on IMF staff members’ hands-on experience and empirical work.** Key findings include:

- LIDCs can raise their tax-to-GDP ratio by, on average, 6.7 percentage points to achieve their full potential, given current institutions and economic structures. Institutional reform, by bringing them to the level of emerging market economies (EMEs), can raise an additional 2.3 points. The total—9 percentage points of GDP—would go a long way toward enabling the state to play its role more fully in sustainable, inclusive, and resilient development.
- This revenue increase requires strengthening the design of core taxes—VAT and excises and personal and corporate income taxes. The focus should be on tax base broadening through reforming ineffective tax expenditures, more neutral taxation of capital income, and better use of real property taxes—thus accounting for both efficiency and equity considerations.
- Improvement in institutions that govern the tax system and manage tax reform is key to yielding results. It calls for adequate tax policy units to forecast and analyze the impact of tax policies across all economic policy dimensions, greater professionalization of public officials working on tax design and implementation, better use of digital technologies to strengthen revenue administrations, and transparency and certainty in how policy and administration are translated into legislation.
- Tax capacity must continue to rest primarily on improving the design and administration of the core domestic taxes. Ongoing international cooperation on the taxation of the profits of multinational enterprises (MNEs), though important, is insufficient to meet revenue mobilization needs of LIDCs and should not distract from pursuing the wider objective of building tax capacity for development.

## I. Why Improve Tax Capacity?

**Achieving the Sustainable Development Goals (SDGs), addressing climate change, and stabilizing debt in low-income developing countries (LIDCs) requires a significant and sustainable boost in tax revenue.** The COVID-19 pandemic has exacerbated the challenges faced by LIDCs in mobilizing revenue to fund their spending needs. For example, Gaspar and others (2019) estimate that additional spending in LIDCs averaging nearly 16 percent of GDP per year would be required to achieve the SDGs by 2030.<sup>1</sup> Benedek and others (2021) suggest that the COVID-19 pandemic is likely to have increased these needs—at above 20 percent in Rwanda for instance (Figure 1). COVID-19 has also increased debt levels in LIDCs as countries implemented spending measures to address its health and economic consequences. At the beginning of 2023, 11 LIDCs were in debt distress and another 28 were at high risk of debt distress (IMF 2023b).

**Figure 1. Additional Annual Financing Needs to Meet the SDGs in Selected Countries (Percent of GDP)**



Source: Benedek and others (2021).

**Beyond its fiscal function, tax capacity is associated with accelerated growth and better institutions.**

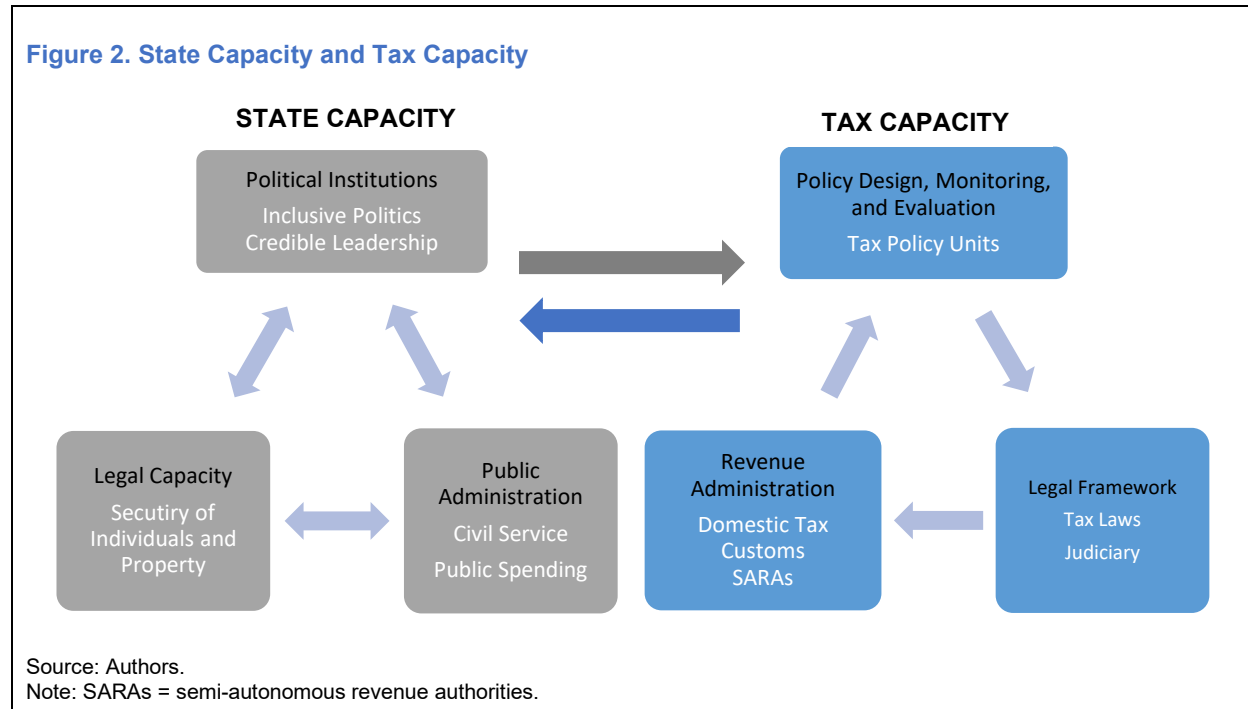
Gaspar, Jaramillo, and Wingender (2016) estimate that once a country crosses a tax (excluding Social Security Contributions—SSCs) revenue level of 13 percent of GDP, the likelihood of an acceleration of growth increases significantly. Their interpretation, following Besley and Persson (2013), is that revenue collection enables the state to fund public spending and improve the quality of market-supporting institutions. In this sense, tax capacity is the cornerstone of state capacity. There are also indirect means through which tax capacity contributes to strengthening state capacity. For example, a simple and fair tax system can support improvements in public finance management and help build credibility among citizens that taxation is necessary to fund reasonably efficient and transparent programs that private markets, left to their own devices, could not deliver. And a modern revenue administration can spur wider innovation in other government agencies and policy areas, strengthening the social contract between the state and citizens.

**Extending the scope for taxation requires forward-looking investments in institutions, tailored to individual country circumstances.** Figure 2 illustrates how tax capacity depends on state capacity—and how this relationship matters for investments in tax institutions.<sup>2</sup> Inclusive politics and a stable leadership are essential to avoid policy capture by interest groups and to address political economy hindrances to reform. Absent enabling political conditions, socially sensitive tax reforms—for example, streamlining inefficient value-added tax (VAT) exemptions—may be difficult to implement. Legal capacity—the judicial system and property rights—is also vital to effective tax collection.

<sup>1</sup> See further detail at <https://www.imf.org/en/Topics/SDG/sdg-financing>.

<sup>2</sup> See Akanbi (2019) for an empirical investigation of how tax capacity and state institutions reinforce each other, particularly in developing countries.

Figure 2. State Capacity and Tax Capacity



**This note provides practical lessons and guidance on how to improve tax capacity, with emphasis on LIDCs, building on IMF staff members' hands-on experience, and empirical work.** Section II reviews developments in tax revenues since 1990. Section III offers suggestions for strengthening the design of core taxes—VAT and excises and personal and corporate income taxes—with a focus on reducing distortions caused by tax expenditures, effective taxation of capital income and real property taxes, and heightened attention to inequalities caused by tax design. Section IV makes the case for an institution-based and holistic approach for tax design, which rests on integrating the impact analysis of taxation across all economic policy dimensions (through the creation of tax policy units), greater professionalization of public officials working on tax design and implementation, use of digital technologies to strengthen revenue administrations, and full transparency and certainty in how policy and administration are translated into legislation.

## II. Progress and Potential

### A. Trends in Revenue Mobilization

**Tax revenues have increased steadily in LIDCs.**<sup>3</sup> From about 10 percent of GDP in the early 1990s, tax revenues (including SSCs) stood at 13.8 percent of GDP in 2020 but has stagnated since 2010—which roughly coincides with the 2008 global financial crisis. In comparison, in EMEs, the ratio increased by 4.9 percentage points of GDP over the same period and has also stagnated since 2010 (Figure 3).<sup>4</sup>

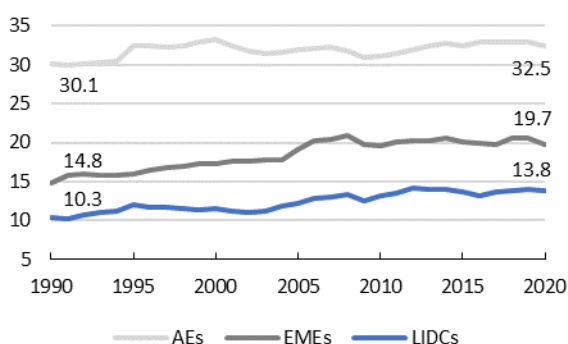
<sup>3</sup> Social security contributions are included in tax revenue developments in this section, to provide a full picture. Due to country institutional and data limitations, their coverage in the World Revenue Longitudinal Database (IMF Fiscal Affairs Department, 2022, hereafter referred to as WoRLD) for LIDCs is not as extensive as it is for the other groups.

<sup>4</sup> Although the note focuses on LIDCs, some of the conclusions and lessons are also relevant for EMEs.



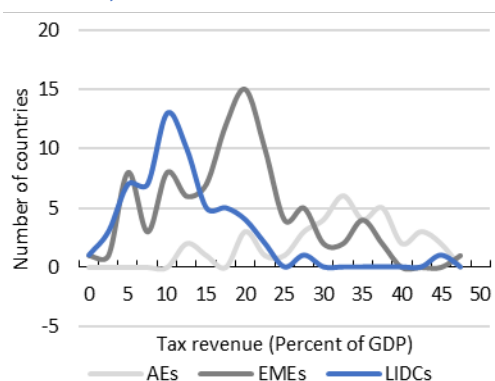
**Tax-to-GDP ratios have increased with changes in development levels.** Countries with larger economic output and stronger institutions, with few exceptions, have been able to mobilize more tax revenue. For LIDCs, the distribution of tax-to-GDP is tightly centered around 10 percent, with only few countries collecting more than 15 percent. This is consistent with the critical 13 percent tax ratio threshold found in Gaspar, Jaramillo, and Wingender (2016). It suggests that because many LIDCs have not crossed that threshold, they have yet to evolve in GDP per capita (and therefore in their tax ratio) toward EMEs. The distributions of EMEs and AEs are centered around 20 and 30 percent of GDP respectively (Figure 4) and exhibit greater dispersion—which could indicate that some countries, especially EMEs with abundant non-tax revenue, willingly choose to keep tax revenue levels low, despite exhibiting some characteristics that suggest a higher tax potential.

**Figure 3. Tax Revenue, 1990–20**  
(Percent of GDP)



Source: Authors, based on WoRLD.  
Note: Tax revenue includes Social Security Contributions.

**Figure 4. Country Dispersion around Tax Revenue, 2020**

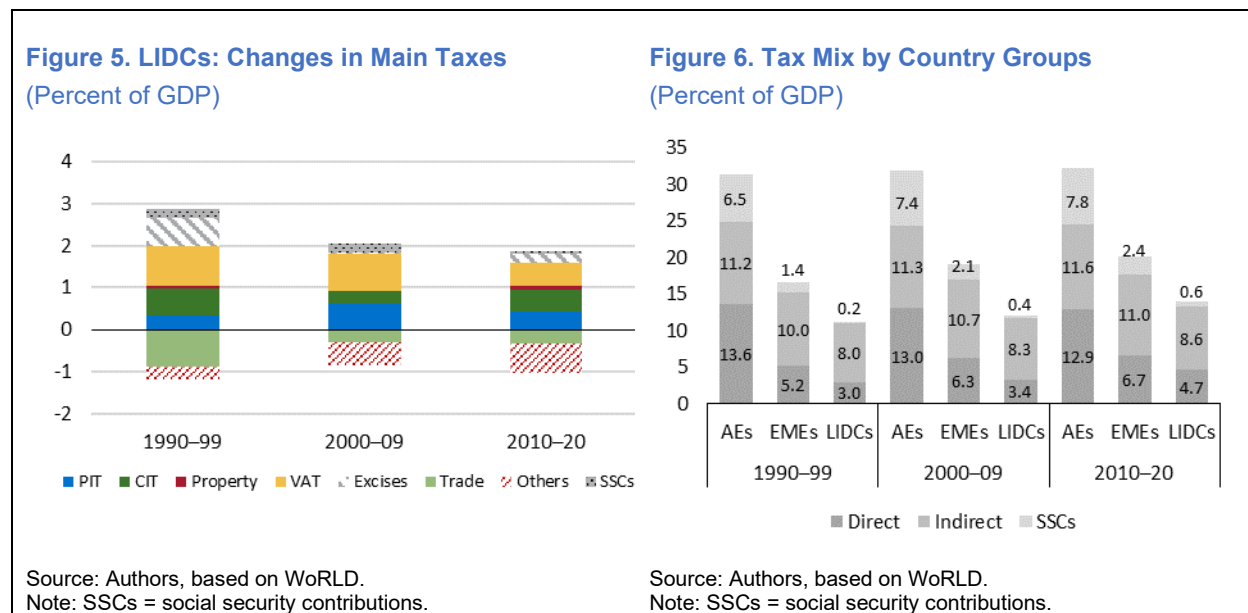


Source: Authors, based on WoRLD.  
Note: Data are for 2020 and include social security contributions. Countries with tax revenue-to-GDP below 5 percent are either fragile and conflict-affected or resource-rich with ample non-tax revenue.

**Taxes on consumption and more recently on income spurred revenue growth in LIDCs (Figure 5).** The growth of the VAT during 1990–99 and 2000–09 contributed to an increase in total tax revenue by 1.9 percentage points of GDP, more than compensating for losses from taxes on international trade and other taxes (1.2 and 0.8 percent of GDP, respectively). This policy shift represented a fundamental departure from distortive trade taxes in favor of more efficient consumption taxes,<sup>5</sup> and an administrative challenge which required collecting taxes from a large number of domestic enterprises in addition to few large importers at the border. VAT performance has continued to improve during 2010–20, contributing to an increase in total revenue collection by 0.7 percentage points of GDP, with a peak in 2012. The largest improvement in the last two decades (2000–20), however, has been on income taxes. LIDCs' tax revenue was bolstered by improvements in CIT (1.0 percentage point of GDP), PIT (0.8 percentage point of GDP), and to a lesser extent property taxes and excises.

<sup>5</sup> Revenue from taxes on trade, essentially the external tariff on imports of goods, remains important in LIDCs, accounting for about 14 percent of total tax revenue on average in 2020. The shift from trade to domestic taxes in LIDCs has slowed in the past two decades. Capacity limits to administer domestic taxes is one among other factors that could explain this deceleration.

**Consumption-based taxes are the main source of revenue for LIDCs, but income-based taxes are on the rise (Figure 6).** Consumption taxes represented approximately 62 percent of all taxes, down from over 70 percent in the 1990s—when they tallied 8.0 percent of GDP. The reliance on indirect taxes decreases with the level of development, and as LIDCs have continued to develop, the tax mix continues to shift. This is no coincidence: since indirect taxes are easier to collect and enforce, LIDCs tend to rely on them to compensate for lower institutional capacities. The rise of income-based taxes in LIDCs (from 24 percent of total tax revenue in the 1990s to 34 percent in the 2010s) contribute both to revenue mobilization and potentially to improving overall progressivity of taxation, as has been the case in AEs (Benedek, Benítez, and Vellutini 2022).



**The COVID-19 pandemic had a large negative impact on tax revenue in LIDCs but motivated an acceleration in digitalization of revenue administrations.** The temporary and sharp decline in tax revenue reflected local restrictions and spillovers from the global economic slowdown (IMF 2022). Revenues rebounded during 2021–22 and are now at their pre-COVID-19 levels in most countries, reflecting strong tax buoyancy (Aslam and others 2022). Nevertheless, COVID-19 showed the criticality of resilient tax systems, and accelerated the move toward digitalization of tax administrations, providing an opportunity to enhance taxpayer services and to invest in information and communication technologies (ICT) (Mengistu and Nose 2023).

## B. Tax Potential and Tax Effort

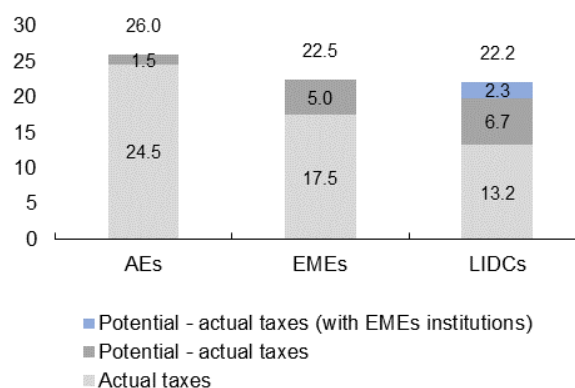
**Besides institutional factors, differences in revenue mobilization across countries are also driven by differences in economic structures.** This begs the question of how much more revenue LIDCs can credibly raise given their economic and institutional capabilities. Estimates of tax potential, defined as the highest level of tax revenue (excluding SSCs)<sup>6</sup> a country can mobilize under comparable situations, based on an empirically determined benchmark observed in other countries, provide useful insights (see Annex 1 for technical details).

<sup>6</sup> Unlike the comparative analysis of actual tax revenues presented earlier, SSCs are excluded from the estimation of tax potential, as some countries earmark them to fund pension and other social transfers more strongly than others. This weakens their interpretation as a tax in comparative analysis since a tax is a compulsory payment for which no direct benefit is expected.

**LIDCs' estimated tax potential amounts to 19.9 percent of GDP, and their average tax effort is 0.67 (Figure 7).**

Tax effort is the ratio of the observed level of tax collection over the tax potential (or frontier), which is the highest observed level controlling for country characteristics including GDP per capita, the size of the agriculture sector, and, importantly, government effectiveness and the perception of corruption in the public sector. Differences in tax effort estimates reflect variations in tax policy, tax compliance, and interactions between the two factors. The estimates imply LIDCs could raise 6.7 percentage points of GDP of additional tax revenue. In comparison, in AEs and EMEs, tax potentials are estimated at 26 and 22.5 percent of GDP, indicating a tax effort of 0.94 and 0.78. Focusing on the VAT, which accounts for about one third of tax revenue, microdata-based studies have decomposed the tax gap into a compliance gap and a policy gap, showing that the former is markedly higher in LIDCs than it is in other country groups.<sup>7</sup>

**Figure 7. Tax Potential and Tax Effort, 2020**  
(Percent of GDP)



Source: Authors' estimates.

Note: Actual and potential revenue estimates exclude social security contributions.

**Tax efforts differ across geographical regions.**<sup>8</sup> In LIDCs and EMEs, the Middle East and Central Asia (MECA) region lags behind, with an average effort of 0.55, relative to a range of 0.67 to 0.98 in the other regional groups. This likely reflects the reliance on oil and gas revenues, and a policy choice to raise less revenue from other tax sources. LIDCs in sub-Saharan Africa (SSA) have a similar tax effort to those in other regions (and higher than MECA), while EMEs in SSA fare better than other regions. In the AEs group, the effort is highest in Europe (1.0) and lowest in Asia-Pacific (0.8), with the Western Hemisphere in the middle, at 0.9.

**Improvements in government quality could raise additional tax revenue in LIDCs (Table 1).**

The empirical results suggest that the tax potential critically depends on indicators of state capacity, as proxied by government effectiveness estimates. This is illustrated by simulations where government effectiveness scores in LIDCs are set, as aspirational objectives, respectively to the average of EMEs and with an increment of one standard deviation, holding all else constant.

Under this scenario, the associated tax potential increases by an additional 2.3 percentage points of GDP, reaching 22.2 percent of GDP—reflecting the

**Table 1. Tax Potential Simulations for LIDCs**

LIDCs' government effectiveness set at:	Increase in Tax Potential	New Tax Potential
	Percent of GDP	
EMEs average	2.3	22.2
LIDCs average + one SD	2.8	22.7

Source: Authors' estimates using coefficients in Annex Table 2, column 5.  
Note: The standard deviation (SD) is for the entire sample.

<sup>7</sup> See Hutton (2017). The VAT tax gap is estimated in relation to a country's own tax base, typically final private consumption. On the other hand, a VAT tax potential would be estimated in relation to the base and policy and institutional choices of other countries.

<sup>8</sup> Regions are grouped according to the IMF institutional grouping: Africa, which includes primarily sub-Saharan Africa, Asia and Pacific (excluding Central Asia), Europe, Middle East and Central Asia, and Western Hemisphere (North, Central, and South America).

quantitative significance of institutional quality in revenue collection in historical data. Correspondingly, improving government effectiveness by one standard deviation of the distribution of that variable would increase the tax frontier by 2.8 percentage point of GDP (to 22.7 percent of GDP). Jointly, these results suggest the potential for more tax revenue in LIDCs that would accrue from an improvement in institutions. In the real world, most of these factors are interrelated, and a holistic approach to government reform is more likely to succeed than a piecemeal approach.

**A Medium-Term Revenue Strategy (MTRS) is one approach that can help address these interlinkages (Box 1).** MTRS serves as the glue binding together various government agencies involved in tax policy design and implementation, taxpayers and civil society engaging with the tax system, and external development partners supporting reforms. Box 2 provides an example of how Morocco improved its tax effort and capacity by coordinating these various elements over long periods of sustained reforms.

### Box 1. The Medium-Term Revenue Strategy

A Medium-Term Revenue Strategy (MTRS) frames tax system reform holistically over the medium term with four interdependent components:

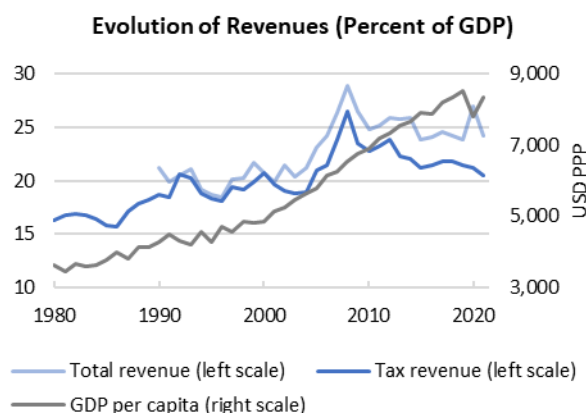
- A revenue target to support economic and social development.
- A comprehensive approach addressing policy, administration, and legal framework interlinkages.
- A sustained political commitment from formulation to implementation.
- A coordinated support among capacity development partners to align with government leadership and priorities.

The MTRS has been used in 24 countries, including eight LIDCs (PCT 2022).

### Box 2. Tax Reforms and Tax Capacity in Morocco

Morocco, driven by a difficult fiscal situation, introduced a first wave of fundamental tax reforms in the mid-1980s: a VAT, a CIT, and changes to PIT. The impact was immediate: tax revenues increased sharply from the mid-1980s to the mid-1990s but stagnated thereafter for a decade. Further reforms were introduced in the late 1990s and early 2000s to reduce preferential tax regimes, and social insurance charges were brought in 2005. On institutions, Morocco started in the late 1990s holding national tax dialogues through its *Assises sur la Fiscalité* (1999, 2013, 2019) to take stock of reforms' impact over 5-10 years and define new medium-term strategies through an inclusive approach. In 2006, it became a pioneer in Africa by publishing its first tax expenditures reports. A bold project to reform a fragmented tax administration along functional lines started in the early 2000s and lasted for about a decade.

Despite these successes, further progress is possible. The 2019 *Assises sur la Fiscalité* resulted in a *Loi cadre* (a reform framework akin to an MTRS) highlighting the importance of: (1) lower level and number of tax rates and wider tax bases to reduce tax inefficiencies; (2) further reductions in preferential tax regimes; and (3) convergence of multiple tax rates to a single rate, notably for CIT and VAT. These changes demand a renewed political commitment and improvements in tax administration and analytical capacity to effectively communicate reform objectives. They also highlight the importance of a broader and deeper shift to information-based tax institutions.



### III. Tax Policy: Strengthening the Core

**This section reviews the evolution and performance of key taxes in LIDCs and suggests a way forward to strengthen their design.** In doing, a special attention should be given to the quality of the overall tax system, to strike a balance between efficiency and equity objectives given a set of national preferences. There is no one-size-fits-all, as development of tax systems reflect national priorities and their evolution in time.<sup>9</sup>

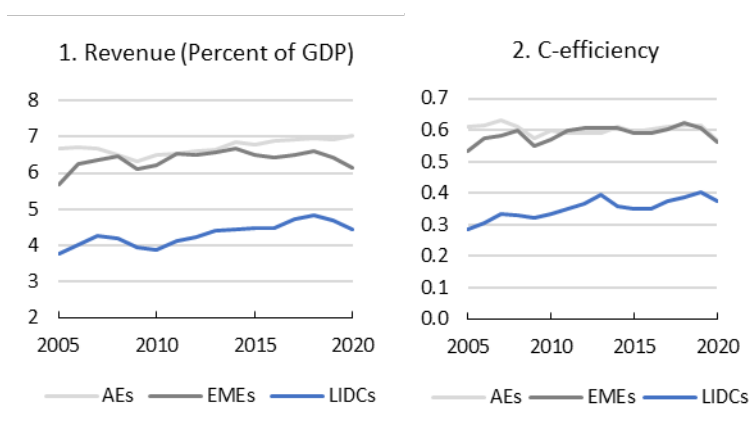
#### A. Taxing Consumption

##### The untapped revenue potential of VAT

**The VAT is central to revenue mobilization in LIDCs, but exemptions and reduced rates erodes its performance** (Figure 8). VATs raised on average 4.7 percent of GDP in 2019, well below EMEs' average of 6.4 percent. Standard VAT rates, averaging about 15 percent (the same in EMEs and 18 percent in AEs) are not low and do not raise particular concerns for the low revenue productivity. C-efficiency,<sup>10</sup> however, was 37 percent on average in 2020, reflecting a combination of exemptions to final consumers, reduced rates, and relatively high revenue administration gaps. Basic commodities (for example, staple foods, transportation, electricity, gas) are commonly taxed at reduced rates or exempted. In 2020, VAT tax expenditures (the revenue cost of VAT exemptions and reduced rates) amounted on average to about 1.3 percent of GDP in LIDCs (0.8 percent in AEs and 0.6 percent in EMEs).<sup>11</sup>

**Aligning the VAT with changing consumption patterns due to digitalization presents an opportunity to broaden its taxable base in LIDCs.** Effectively levying VAT on the import of digital services and parcels bought online, will increasingly be vital to protect the taxable base, as consumers shift to online digital services and direct purchases of goods from foreign vendors.<sup>12</sup> It also helps to ensure a level playing field for domestic businesses.

**Figure 8. VAT Revenue and C-efficiency, 2005–20**



Source: Authors, based on WoRLD.

<sup>9</sup> For a complementary discussion, see also de Mooij and Abdel-Kader (2020), de Mooij and others (2020), and IMF (2011).

<sup>10</sup> C-efficiency is the ratio of observed VAT collections over its theoretical potential calculated by applying the standard VAT rate to aggregate private consumption.

<sup>11</sup> Redonda, von Haldenwang, and Aliu (2022).

<sup>12</sup> The emerging international norm is to allocate taxing rights under the VAT to the jurisdiction in which consumption occurs and to implement a vendor collection model (Brondolo and Konza 2021).

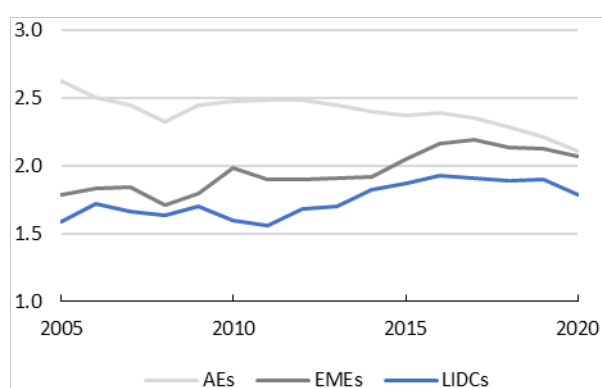
### Excises can complement VAT and address externalities

**Excise taxes can be used in LIDCs to raise more revenue and reduce the impact of externalities and internalities through changes in consumers behavior.** Excises on petroleum products, alcoholic beverages, tobacco products and equivalent, unhealthy foods (for example, sugary drinks),<sup>13</sup> and plastic waste, have the appeal of being widely consumed, but relatively easy to collect from a limited number of producers, or on imports at the border. Their revenue yield, typically between 1.5 and 2.5 percent of GDP, has been trending upward in LIDCs and EMEs (Figure 9). There is room to increase excise revenues through better design and consistent applications across taxpayers—especially importers vs. domestic producers, and state-owned vs private enterprises.<sup>14</sup>

### Excises are potentially significant as mitigation tools for climate-related risks.

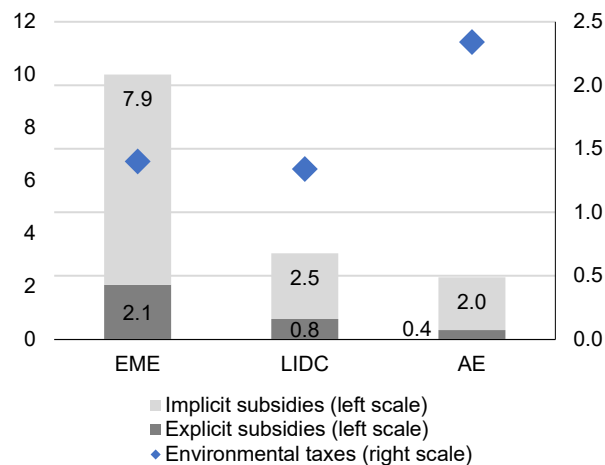
LIDCs can make more and better use of environmental taxes. Carbon pricing is needed to address externalities (IMF 2021). Fuel excises are a form of carbon pricing and have been used for a long time in LIDCs, primarily as a revenue instrument, but with rates set relatively low and differentiation across product types not reflecting their carbon content or environmental externalities. Reducing implicit and explicit fuel subsidies (Figure 10) and promoting decarbonization (with specific excise rates reflecting the carbon content of fossil fuels) could raise additional revenues and help achieve climate objectives. Overall, carbon taxes<sup>15</sup> in the form of excises on fuel and motor vehicles have significant practical, environmental, and

**Figure 9. Excise Tax Revenues, 2005–20**  
(Percent of GDP)



Source: Authors, based on WoRLD.

**Figure 10. Explicit and Implicit Fuel Subsidies, Average 2015–20**  
(Percent of GDP)



Source: Based on Parry, Black, and Vernon (2021).  
Note: Explicit subsidies refer to undercharging relative to production costs; implicit subsidies are the estimated costs of consumption externalities.

<sup>13</sup> For a primer on how to design excises on tobacco, sweet beverages, and alcoholic beverages, see, respectively, Petit and Nagy (2016); Petit, Mansour, and Wingender (2021); and Mansour, Petit, and Sawadogo (forthcoming).

<sup>14</sup> A caveat is that revenue from excises will ultimately decline if these taxes have the desired effect of healthier living and less polluting.

<sup>15</sup> Carbon taxes can be levied at different points of the production chain of fossil fuels. One point is extraction (upstream), where the tax can be based on the carbon content (Parry, Black, and Vernon 2021). Another is downstream, at the point of consumption, and on carbon dioxide emissions. Obviously, given that not all countries are producers of fossil fuels, and in the absence of international coordination, the mix of upstream vs. downstream-based carbon taxes is country dependent.

economic advantages, especially for LIDCs due to ease of administration, price certainty which promotes investment, the potential to raise significant revenues, and coverage of broader emissions sources. Carbon taxes can be combined with feebates<sup>16</sup> to promote decarbonization of vehicles and to gain broader acceptability.

### Consumption taxes and equity

**The regressivity of the VAT needs to be considered in the context of the overall tax and spending system, as well as the overall tax policy mix.** A well-designed VAT is an efficient revenue instrument in that it induces a minimal cost to economic activity per dollar of revenue raised. VAT exemptions and low rates, commonly used in LIDCs (and more widely), perform poorly in addressing the regressivity of the tax in relation to incomes— that is, that VAT liability as a share of individual income declines as income increases. The revenue loss from such policies tends to be high relative to the benefit that accrues to low-income individuals, and high-income individuals benefit more in absolute terms—simply because they consume more. A greater impact on poverty reduction can be made by transfers to low-income households (Warwick and others 2022).

**Carbon taxation tends to be moderately regressive in advanced economies but can be progressive in LIDCs.** For example, poor households in India spend a smaller share of their budget on electricity than richer households, making carbon taxation there progressive (IMF 2021). The same applies to excises on fossil fuel and motor vehicle, as they tend to represent a larger share of high-income budgets in LIDCs. In this sense, corrective excise taxes levied on consumption of goods that generate pollution can be a “win-win” opportunity for redistribution as well as reducing tax inefficiencies (Bastagli, Coady, and Gupta 2015).

## B. Taxing Income and Wealth

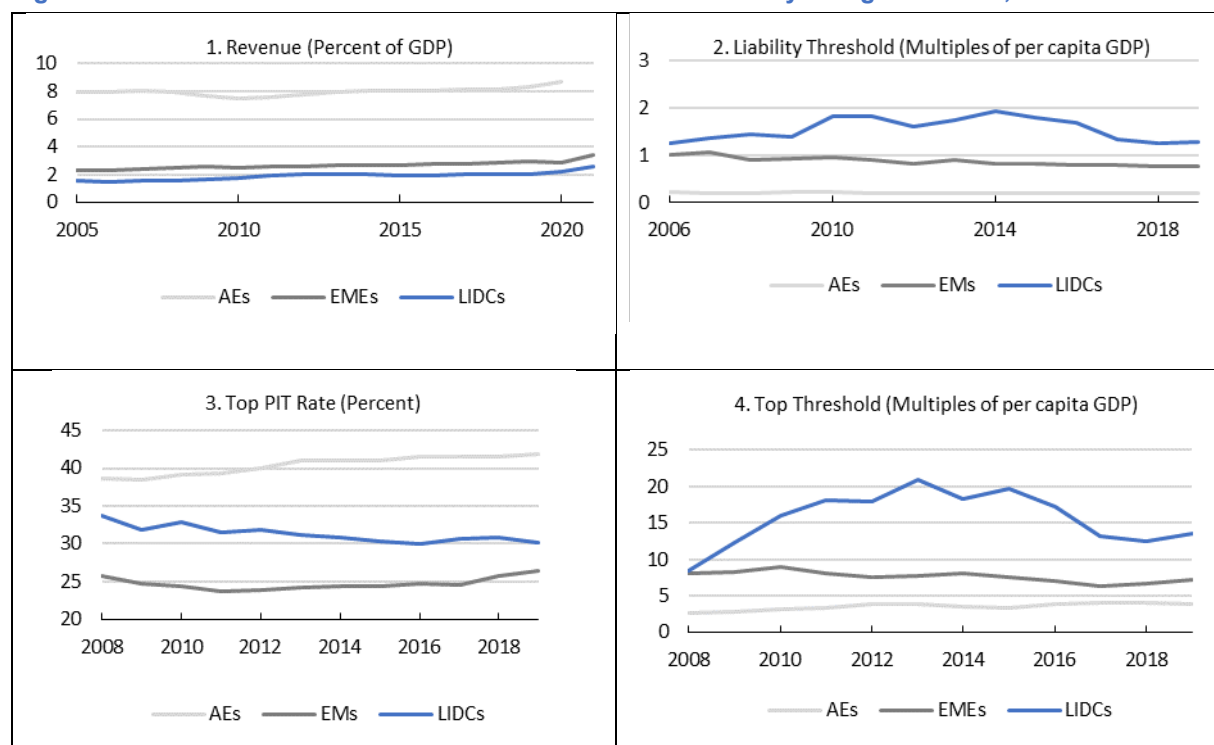
**Revenue from personal income taxes (PITs) have progressed in LIDCs.** On average, PITs raised 2.5 percent of GDP in 2021, up from 1.5 percent in 2005 (Figure 11, panel 1). There is scope for improving design to increase revenue and progressivity, and strengthen redistributive capacity (Benedek, Benítez, and Vellutini 2022). In Many LIDCs, design weaknesses include a high exempt threshold (panel 2); a relatively low top rate (panel 3); and a relatively high top income threshold, above which the top rate applies (panel 4). Also, because labor formalization is often an issue in LIDCs, simplified regimes for the self-employed and micro-enterprises can improve compliance.<sup>17</sup>

**Taxing wealth could generate additional revenue and be redistributive.** The first step in many LIDCs would be to reinforce the taxation of the return on wealth or capital income (for example, interest, dividends, capital gains), which is often absent or levied at significantly lower rates—and could be collected through final withholding (Benedek, Benítez, and Vellutini 2022, IMF 2017a). Countries with well-developed and effectively implemented PITs can consider inheritance taxes. These are relatively easier to implement than recurrent wealth taxes and face lower compliance risk. Taxing wealth or net wealth is the least feasible option in LIDCs given information and capacity constraints.

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<sup>16</sup> Feebates apply a revenue-neutral, sliding scale of fees on products or activities with above average emissions and a sliding scale of rebates on products or activities with below average emissions. Feebates can be combined with and complement carbon pricing schemes to reduce emissions per unit of production or activity in sectors with high carbon emissions.

<sup>17</sup> Lowering compliance costs is crucial in LIDCs given the prevalence of informality (enterprises not registered with the tax administration). Informality can also be mitigated through the design of VAT and presumptive taxes for small and micro businesses.

**Figure 11. Personal Income Taxes: Evolution of Revenue and Key Design Features, 2005–20**

Source: Benedek, Benítez, and Vellutini (2022).

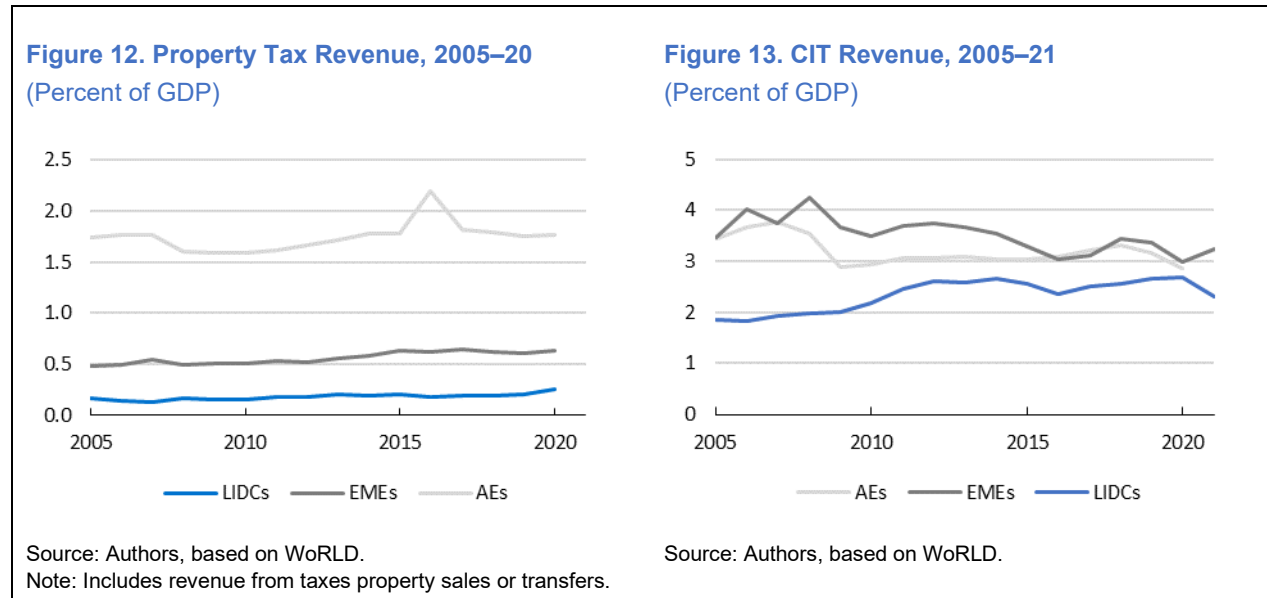
**Recurrent taxes on real property<sup>18</sup> can be effective in raising revenue and enhancing progressivity.** The property tax, which several LIDCs have adopted in some form, which raises on average 0.25 percent of GDP (0.6 percent in EMEs, Figure 12). Because it is relatively easy to collect once the appropriate administrative infrastructure is in place (namely, a cadaster and property valuation systems), and is mostly redistributive<sup>19</sup> and efficient, it can be an important element of equitable revenue mobilization in LIDCs. The recurrent property tax can also be a tool to strengthen central-sub-central government fiscal coordination, as it has been historically assigned to local governments.

**The CIT is an important source of revenue in low-income countries.** Because it is levied on corporations, which are fewer than natural persons and tend to be better organized informationally, the CIT is relatively effective as a tax revenue instrument in weaker institutional environments. CIT revenue in LIDCs is closer on average to other country groups (Figure 13). Like the VAT, however, the CIT base can be affected by costly tax expenditures. Pervasive investment incentives to attract foreign direct investment by providing outright CIT exemptions and tax holidays are generally costly, in addition to being ineffective, inefficient, and prone to abuse (PCT 2015).

<sup>18</sup> Although real property is a form of wealth, recurrent taxes on real property are not, strictly speaking, net wealth taxes, since they do not allow for the deduction of liabilities incurred to acquire real property (for example, mortgages).

<sup>19</sup> As the very rich hold a smaller part of their wealth in real estate, a property tax loses its progressivity at the top of the income distribution.





**The proposed global minimum tax under Pillar 2 of the Inclusive Framework agreement is an opportunity for LIDCs to re-design their investment tax incentives (IMF 2023a).** The minimum tax would likely further dampen the effectiveness of tax incentives by reducing the benefit to investors. Such incentives can therefore be reformed to make the CIT less distortionary—for instance, by introducing full expensing for some capital goods, bringing the tax closer to a cashflow tax, or allowing a cost for equity investment to neutralize the debt bias and reduce profit shifting (IMF 2016, De Mooij and Hebous 2017). More generally, because it reduces the incentive for tax competition (Fuest and Zodrow 2013, Klemm and Liu 2019), Pillar 2 should lead to a fundamental rethink of the design of CIT in LIDCs, with less pressure to cut the standard rate (IMF 2023a) and more innovative policies to reduce distortions through the tax base. The revenue impact of the global minimum tax has been estimated at 0.15 percent of GDP, potentially rising to 0.4 percent in the longer run once second-round effects from reduced tax competition are accounted for (IMF 2023a). LIDCs stand to gain a modest share of this global impact.

**Simple policies can be effective in managing the risk to the tax base from MNEs cross-border transactions.** Even with the Pillar 2 minimum tax, profit-shifting and abusive tax avoidance will remain a risk. Governments in LIDCs face similar challenges to AEs from cross-border spillovers but have limited capacity to implement complex transfer pricing regimes. Efforts can usefully focus on simple yet effective anti-abuse provisions and on expanding source taxing rights, including by revisiting tax treaties (Beer, Hearson, and Loeprick forthcoming, PCT 2021). For instance, current consideration to introduce fixed margins for some distribution and marketing activities of MNEs could be expanded. Limitations on the deductibility of base-eroding expenses and retention of meaningful interest rates on services can offer a similar remedy to mitigate base erosion risks and tend to be more commensurate with existing administrative constraints (IMF 2023a).

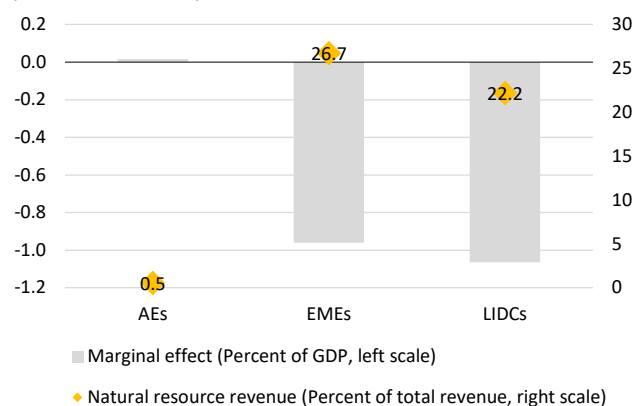
## C. Taxing Natural Resources

**Nonrenewable natural resources (oil and gas and mining) are important sources of revenue in LIDCs.** It is quite common for countries to have sector-specific taxes, in addition or in lieu of general taxes, to address sectoral particularities, such as location-specific economic rents that can be taxed at higher rates without strong investment reaction. As shown in Figure 14, developing countries have relied considerably on natural

resources to generate revenue. During the past three decades, the share of natural resource revenue represented, on average, 27 and 22 percent of total revenue in EMEs and LIDCs, respectively.

**Reliance on natural resource revenue exhibits a negative relationship with tax effort in LIDCs.** An analysis of the relationship between natural resource tax revenue and other tax revenue shows that an increase in one percentage point of GDP in the former is associated with a statistically significant reduction of 1.06 percentage points in the latter in LIDCs, and 0.96 points in EMEs. In contrast, AEs show a positive, albeit small and insignificant relationship. This suggests that developing countries endowed with natural resources substitute away from mobilizing non-resource tax revenue,<sup>20</sup> calling for a need for balanced tax reforms.<sup>21</sup>

**Figure 14. Marginal Effect of Natural Resource Revenue on Tax Revenue (Percent of GDP)**



Source: Authors' estimates.

**The relationship between resource and non-resource tax revenue could also have implications for tax institutions.** Countries that are rich in natural resources and tax very little tend not to invest in tax institutions—an extreme case of how resource revenues affect institutions. The most common situation, however, is one where both natural resource revenues and tax revenue prevail. In this case, an increase in the former could have, in addition to the revenue impact noted above, dire consequences on tax institutions and state tax capacity—through, for instance, lax compliance enforcement and depreciating human knowledge and capital. Revenue from natural resources should not come at the expense of developing the wider tax system—this is especially the case of fragile states (Mansour and Schneider 2019, IMF 2017b).

**A well-designed natural resource fiscal regime combines several instruments.** The objective is to capture a substantial share of economic rent from more profitable projects while ensuring early and dependable revenue from the start of production. As such it is generally advisable to use profit and rent taxes together with royalties (less sensitive to profitability) and to design the overall fiscal regime to be progressive in relation to profitability outturns while providing certainty and clarity in the presence of high volatility in international prices.

## IV. The Role of Supporting Institutions

### A. Building Tax Analysis Capacity: Tax Policy Units

**The effectiveness of tax policy choices in achieving their objectives is informed by ex-ante analysis and ex post monitoring and evaluation.** Institutionalization of tax analysis capabilities are relevant and

<sup>20</sup> Previous studies have also found a statistically significant and negative relationship between resource revenue and total non-resource revenue (Crivelli and Gupta 2014).

<sup>21</sup> In the long run, resources run out or become obsolete due to technological change.

present in most AEs and (increasingly) EMEs but lacking in LIDCs—even though the cost of “bad” policies in LIDCs is arguably higher, given their lower tax-to-GDP ratios.

**Starting in the early 1970s, most AEs established tax policy units (TPUs) or similar structures in their ministries of finance, to support evidence-based and data-driven policymaking (Grote 2017).** The primary function of TPUs is to act as a technical advisor to government and its institutions. This includes:

- Producing objective analyses of tax reform options by estimating their revenue, distributional, and behavioral impact.
- Producing regular tax expenditures reports and assessment (Heady and Mansour 2019, Beer and others 2022) to provide transparency and monitoring of how government spends through the tax system, thus improving the policy debate and discussion of trade-offs during the budget process. Tax expenditures analysis is especially essential to consider issues of base-broadening, distribution of the tax burden, and cross-cutting policy issues such as environmental, trade and industrial policies.
- Building a baseline of tax revenues over the budget cycle for a given set of policy parameters, and estimating deviations from it, caused internally by policy changes, or externally by shocks to the various tax bases (for example, impact of COVID-19 on VAT revenues). This monitoring is done as part of regular budget implementation, and is frequently included in updates of budget execution, either internally or externally (for example, quarterly fiscal monitor).
- Producing objective and credible communication material to explain to the public the economic rationale and intent behind changes in tax policies, and how such changes link with other economic policies.
- Coordinating relations and collaborating with other governments agencies, and externally with other governments (for example, economic and customs unions; bilateral tax agreements).

**Over the past decade, at least 17 EMEs and LIDCs created tax policy units.**<sup>22</sup> Evidence based on IMF capacity development (CD) suggests that setting up TPUs has not been a seamless endeavor since developing countries often face difficulties with staffing issues (for example, quantitative skills), and ICT (for example, integrated platforms capable of generating timely and readily usable data for building micro-simulation models). In many LIDCs, TPUs were created following technical advice from the IMF and other international organizations. Further capacity building and training for the benefit of these units will help cement their sustainability and credibility.

**The location of TPUs is a critical decision, given its integrating nature.** Tax policy is increasingly a cross-cutting fiscal instrument, spanning many areas, including trade, investment, climate, and strategic sectoral policies—for example, extractive industries, telecommunications, agriculture, industrial policy. The ideal placement of TPUs is therefore at the ministry of finance, as one key element of fiscal policy. This allows for the necessary coordination across central agencies in policy design, including for instance coordinating fiscal and monetary policy, and operational agencies in charge of revenue collection—tax, customs, and agencies collecting non-tax revenues where applicable. To ensure continuity and credibility, TPU capacity needs to be built internally, with only limited recourse to external studies and consultants.

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<sup>22</sup> This is based on an internal survey of IMF staff managing and delivering capacity-building and advisory services in tax policy to IMF member countries.

**Tax policy units have had a positive impact on fiscal management and tax transparency.** In AEs and increasingly EMEs, it is inconceivable for fiscal management to operate without TPUs—the case of several countries is well documented in Grote (2017). In countries where these units were set up in the past decade at ministries of finance, they have produced tax expenditures reports, prepared granular revenue forecasts, estimated the revenue cost of policy options and in some cases produced distributional analyses of tax policy changes, and they have had some impact on drafting tax legislation. Countries without TPUs also generally struggle to produce timely analyses of policy options. The impact of TPUs on revenue mobilization or the tax effort is an empirical question that merits to be explored, but their impact on the quality of available analyses for policymakers and the public has been a positive and encouraging development.

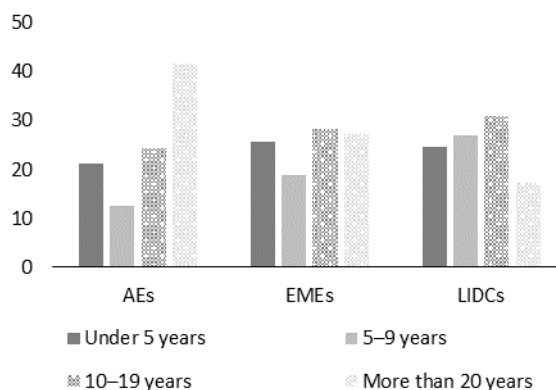
## B. Modernizing and Digitalizing Revenue Administrations

**Strengthening the institutions tasked with collecting revenue is vital for tax capacity.** There is evidence that improving tax administration practices, particularly in relation to compliance risk management and use of third-party data, is associated with growth in revenue collected, after controlling for tax policy changes (Chang and others 2020). Moreover, when mobilizing additional revenue, the choice between improvements in tax administration practices or interventions and policy changes is not trivial and deserve more attention than it is usually given, especially when countries operate under low administrative capacity (Keen and Slemrod 2017).

### Resources and governance

**Revenue administrations need sufficient funding to ensure adequate professional human and ICT resources.** Better human resource management correlates positively with a higher rate of on-time filing of core taxes and lower collection costs. Attracting and retaining the best staff, with the highest integrity standards, lies at the heart of an effective revenue administration. AEs benefit from experienced staff who fits the profile of long staff tenure in specialized technical work areas (Figure 15). The share of experienced staff is smaller in EMEs and LIDCs, which indicates a potential area for improvement (Crandall, Gavin, and Masters 2021). Allocation of staff by function also matters. There is a longstanding difference between the percentage of staff allocated to audit in AEs and LIDCs (with EMEs in the middle): for AEs this exceeds 30 percent, while for LIDCs it is about 20 percent (Figure 16). Up-to-date IT systems are also essential to enhance staff productivity and effectiveness, including to cater to multinational enterprises that have access to the latest technologies and to support digitization.

**Figure 15. Staff Tenure in Revenue Administrations, Average 2018–20**  
(Percent of total staff)



Source: Authors' calculations, based on CIAT, IMF, IOTA, and OECD (2022)

**Ensuring that tax administrations operate at arm’s length from political interference reduces opportunities for rent-seeking behavior.**

For example, to ensure autonomy, some countries have chosen that the head of the revenue authority reports to the ministry responsible for finance through an independent governing Board of Directors. Balancing this necessary independence, governments should ensure accountability and transparency, a foundation of the public’s trust in a fair tax system—and there is evidence that tax administrations in LIDCs lag in respect of accountability (Figure 17, P9). Effective oversight, including internal and external auditing, is vital to the governance of revenue administrations.

**Strengthening cooperation between tax and customs administrations could leverage data use and improve efficiency and effectiveness in revenue collection.**

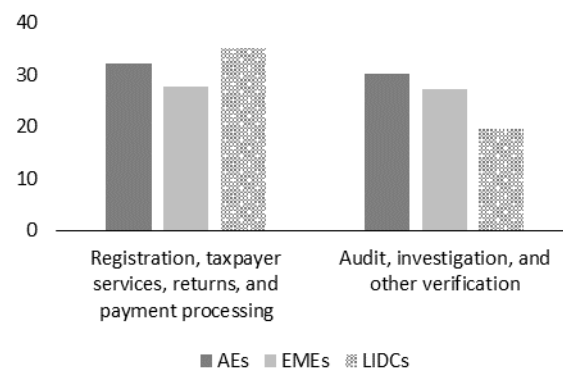
With appropriate governance and management arrangements (for example, cooperation agreements, data exchange gateways), separate revenue agencies can work cooperatively. Integration of the two is also a route that some countries have followed. Of the 166 countries that provided data to the 2021 International Survey on Revenue Administration (ISORA), 40 percent have an integrated administration (34 percent of LIDCs, 44 percent of AEs), suggesting that the rationale for integration is highly dependent on country circumstances. For example, there are strong regional patterns: 58 percent of the tax and customs administrations in sub-Saharan Africa are joint, while the figure for administrations in the Americas is 26 percent.

**Compliance risk management**

**Slicing the taxpayer population in segments with similar characteristics and organizing the tax administration around these segments, can contribute positively to managing compliance risk.**

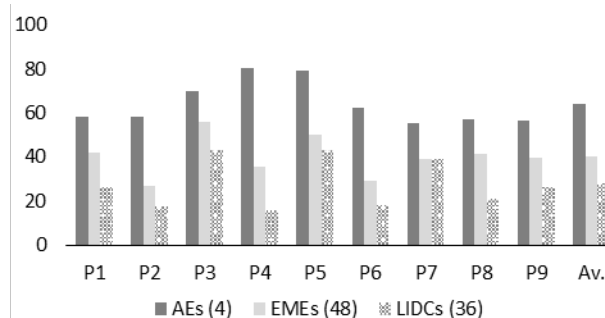
Segmentation by size, profitability, income level, etc. is a key element of a broader compliance risk management which promotes taxpayer services tailored to a set of common characteristics, and enforcement actions targeted to taxpayers who are the most likely to be non-compliant. According to TADAT indicators on

**Figure 16. Allocation of Staff in Tax Administrations, Average 2018–21**  
(Percent of total staff)



Source: Authors’ calculations, based on CIAT, IMF, IOTA, and OECD (2022)

**Figure 17. Average Index Scores for Various Groupings of Revenue Administrations**



Source: Authors’ calculations, based on TADAT data.

Note: “Av.” is the average of all P scores.

P1: Integrity of the Registered Taxpayer Base; P2: Effective Risk Management; P3: Supporting Voluntary Compliance; P4: Timely Filing of Tax Declarations; P5: Timely Payment of Taxes; P6: Accurate Reporting in Declarations; P7: Effective Tax Dispute Resolution; P8: Efficient Revenue Administration; P9: Accountability and Transparency.

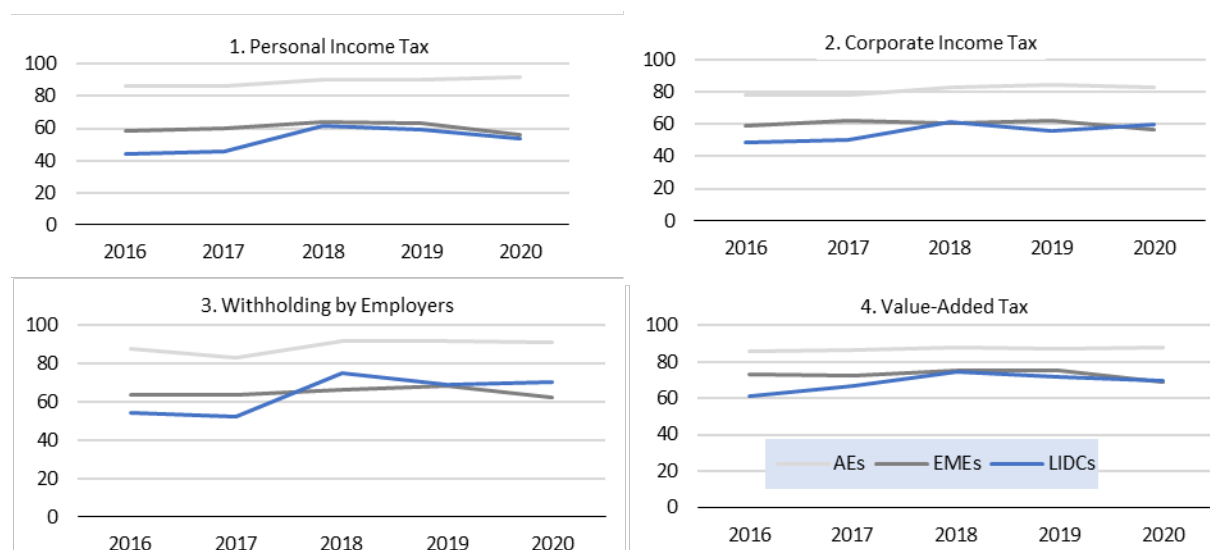
performance outcome areas,<sup>23</sup> LIDCs lag considerably behind EMEs and AEs in implementing risk management (Figure 17, P2).

**Modern revenue administrations maximize voluntary compliance with an integrated, holistic approach combining preventive, detective, and corrective actions.** Taxpayer service strategies, including measures to lower compliance costs, are a critical component of that approach (for example, simplified recordkeeping and reporting requirements for small businesses; pre-filing of tax declarations). Here again, there is ample room for improvement in LIDCs (Figure 17, P3).

### Digitalization and analytics

**Revenue administrations in LIDCs continue to face lower levels of digitalization of core operations— notifying, invoicing, pre-filing, filing and payment, assessments.** On-time filing rates lag those in AEs (but are close to EMEs), especially in respect to the PIT (Figure 18)—a finding also confirmed by TADAT assessments. LIDCs also lag other country groups in electronic filing and the use of third-party data in prefilling tax returns (Figure 19), although the gap has shrunk. Recent empirical research suggests that greater digital adoption in revenue administrations is associated with higher domestic tax revenue collection and a reduction in VAT compliance gap (Bellon and others 2022, Mengistu and Nose 2023). Digitalization is therefore not only an efficiency-enhancing investment but could also enhance revenue without changes in policy.

**Figure 18. On-Time Filing Rate of Tax Returns, 2016–20**  
(Percent of expected tax returns)



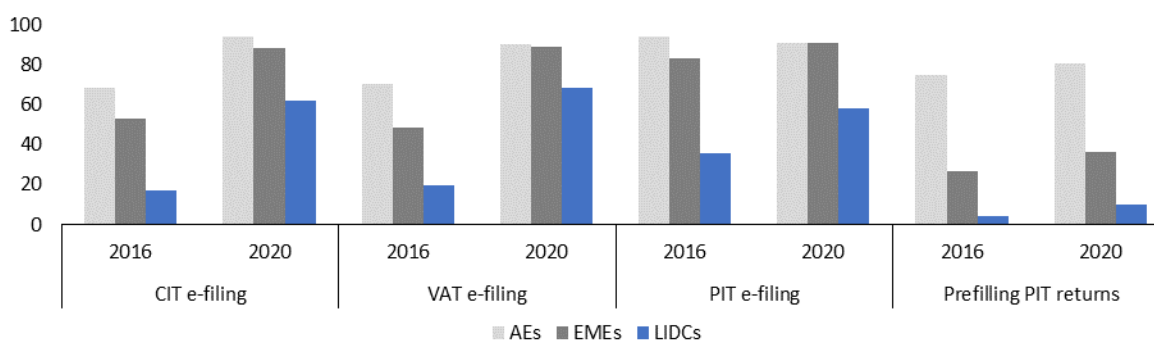
Source: Authors' calculations, based on ISORA, <https://data.rafit.org>

**With digitalization, data and analytics become the cornerstones of effective and efficient operations for tax and customs administrations.** Beyond traditional first-party data (data received directly from individuals

<sup>23</sup> The Tax Administration Diagnostic Assessment Tool (TADAT) produces objective and standardized performance assessment of a country's tax administration and facilitates design of tax administration reform initiatives (see <https://www.tadat.org>). Data were compiled from assessments conducted between 2014 and 2022.

and companies), digitalization and more broadly the deployment of GovTech<sup>24</sup> can generate transaction-level data, including through Electronic Fiscal Devices (for example, real time electronic invoicing). Automatic exchange of information<sup>25</sup> is also potentially important to manage the risk to the tax base from cross-border transactions and investment, but experience suggests that it is still unclear whether LIDCs stand to benefit from participating in it (IMF 2023a, OECD 2022).

**Figure 19. Tax Administrations Offering Electronic Filing and Pre-Filing PIT Returns, 2016 vs. 2020**  
(Percent of all tax administrations with ISORA data)



Source: Authors' calculations, based on ISORA 2018 and ISORA 2021, <https://data.rafit.org>

### C. Ensuring a Sound Legal Framework

**Developing simple and effective tax legislation requires a clear legal framework.** Tax certainty for taxpayers influences investment decisions and can have a significant impact on economic growth. Tax legislation is a critical component of tax certainty (IMF/OECD 2019), and is especially important in LIDCs, where tax certainty and clarity, as well as the inclusive process of policy making, must be protected in a context of relatively weaker institutions.

**The design of tax laws involves striking a balance between simplicity and comprehensiveness.** This is best achieved by requiring the preliminary clause of any provision to set out its overarching principle, with deviations from that principle then explained in more specific provisions that follow. Further rules to allow smooth implementation can be housed in supplementary application rules and regulations.

Experience shows that a credible legislative process should have the following features:

- A tri-partite tax law design model, comprising the ministry of finance (as lead agency with responsibility for tax policy and related legal issues), revenue administration agencies, and non-government stakeholders such as the private sector and civil society organizations.

<sup>24</sup> Digitalization customarily refers to the automation of existing processes. GovTech encompasses new processes, including the generation of new data (Mengistu and Nose 2023).

<sup>25</sup> Countries have collaborated to develop frameworks to facilitate and standardize cross-border exchange of information for tax purposes. These multilateral frameworks, which include the OECD/G20 Common Reporting Standard and the exchange of country-by-country reports, are meant to grant governments access to new information on the offshore activities of their taxpayers.

- Consultation between internal stakeholders should occur at the initial design stage and public consultation should take place in relation to draft legislation where possible.
- Tax laws should be subject to debate, review and/or approval of a representative legislative body before taking effect and the impact of substantive new tax laws should be monitored to ensure that the legislation is operating as intended.
- All tax policies should be in legislation without exceptions. This includes tax incentives, allowances, and other measures which affect tax revenues. This is to ensure that the budget process and the ministry of finance's role in shaping and developing tax legislation is not undermined.
- The frequency of changes in the tax legislation should be kept to a minimum and there should be timely communication of changes.

**A growing number of countries are introducing tax procedure laws separate from tax laws to address administrative aspects across multiple taxes.** This could simplify compliance and make it more effective, especially since interconnectivity of taxes is important for compliance behavior. It also allows policymakers to keep tax laws relatively stable over time. But this practice is not yet widespread among LIDCs.

## V. Conclusions

**LIDCs need revenue to pursue SDGs and manage debt sustainability.** It is estimated that additional spending of 16 percent of GDP is required in LIDCs to meet SDGs. The current debt crisis in some LIDCs has added to the urgency of revenue mobilization. Ongoing international collaboration on the taxation of the profits of MNEs have generated hopes for additional revenue, but these are estimated to be modest for LIDCs. While important, reforms for revenue mobilization should focus on the imperative of leveraging core domestic tax policies.

**There is considerable scope to collect more revenues in LIDCs, measured by their tax potential.** At about 13.2 percent of GDP on average, tax revenues in LIDCs are well below their 19.9 percent potential, holding constant economic structure and the quality of institutions. If governmental effectiveness improves to that of EMEs, that potential increases by another 2.3 percentage points of GDP. When reforms are supported by adequate political buy-in and are appropriately coordinated across complementary policies and institutions, they can bring about quick and meaningful revenue, more tax progressivity, and better incentives.

**Capacity development should increasingly focus on building fiscal institutions.** Investment in tax policy units can help a country identify and prioritize reforms based on country-specific data and be more effective in addressing cross-cutting issues connected with tax policymaking—for example, climate change, industrial policy. Strengthening and digitalizing revenue administrations and ensuring that they are not dominated by political influence, remain well managed and well-funded, is a prerequisite to compliance improvement. Increased use of digital services and processes, taxpayer segmentation, and risk-based compliance management are examples of reforms that can have a sustained impact on revenue collections. A transparent and robust legal framework is necessary for certainty of tax outcomes to taxpayers.

**Coordination is critical to improve tax capacity.** Because the broader institutional context matters, careful prioritization and coordination of reforms across government agencies involved in policymaking is key. For instance, the legal framework of taxation may need to be addressed first; the tax system may need to be



simplified to reduce compliance and implementation burdens. This makes an integrated framework such as the MTRS especially useful. Ultimately, successful tax policy and administration reforms feed into a virtuous circle where tax capacity and state capacity reinforce each other, with additional revenue and improved public goods strengthening policies and institutions, and their public acceptance.

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## Annex 1. Tax Potential and Tax Effort Estimates using Stochastic Frontier Analysis

The tax capacity and tax effort estimates were derived using Stochastic Frontier Analysis (SFA) Modeling. The difference between SFA models and traditional regression approaches is that SFA models assume that the random error is one-sided while traditional regression approaches assume a two-sided normally distributed error (Martinez-Vazquez, Moreno-Dodson, and Vulovic 2012). Therefore, within a SFA framework, a country deviates from its highest observed level of tax revenue collection only by underperforming, whereas a traditional regression approach produces revenue potentials that minimize both positive and negative residuals with respect to observed values—therefore that are not the maxima observed at given values of the explanatory variables. The SFA models a production function in which inputs are transformed into tax revenues and assumes that countries collect less than their full potential due to inefficiencies ( $E_{it}$ ) and random shocks  $v_{it}$ .

$$TR_{it} = f(X_{it}, \beta) \cdot E_{it} \cdot \exp V_{it}; \quad (1)$$

where  $TR_{it}$  is tax revenue and social security contributions for country  $i$  in year  $t$  as a share of GDP,  $X_{it}$  is a set of inputs,  $\beta$  is a vector of coefficients and  $E_{it}$  represents the level of inefficiency, which can take values between 0 and 1, while  $V_{it}$  are random shocks to collection, which are normally distributed and independent of the inefficiency. If  $E$  equals 1, the country is collecting the maximum of tax revenues it can collect, using inputs  $X_i$ .

Taking the natural logarithm of equation (1) provides the basis for the econometric model:

$$\ln(TR_{it}) = \ln[f(X_{it}, \beta)] + \ln(E_{it}) + v_{it}; \quad (2)$$

Assuming the tax revenue input function  $[f(X_{it}, \beta)]$  is linear in logarithms and defining the inefficiency as  $u_{it} = -\ln(E_{it})$ :

$$\ln(TR_{it}) = \alpha + \sum \beta \ln(X_{it}) + v_{it} - u_{it}. \quad (3)$$

where  $v_{it}$  is a normal stochastic error and  $u_{it}$  is also modelled as a (positive) normal stochastic term.<sup>26</sup>

The estimation method in this note uses time-varying inefficiency model for panel data that accounts for heterogeneity in tax collection through the inclusion of observed covariates to explain the tax frontier. The parameters of the stochastic frontier and the inefficiency are estimated simultaneously to avoid bias. The unobserved time-invariant heterogeneity is captured in a “true random effects” model (Greene 2005).<sup>27</sup> Unobserved heterogeneity is interpreted as a lack of tax effort, suggesting that the influence of the unobserved factors could be overcome with tax policy and administration measures.

### Data

The estimation employs a longitudinal dataset with 157 countries spanning 1990–2021. The main sources are the WoRLD dataset for tax revenue and social security contributions while the rest of the employed inputs ( $X_i$ ) are taken from the IMF World Economic Outlook dataset, the World Bank World Development Indicators, and the World Bank Worldwide Governance Indicators dataset.

<sup>26</sup> Some tax effort specifications model inefficiency as explained by a set of specific exogenous variables (McNabb, Danquah, and Tagem 2021).

<sup>27</sup> It is important to note that the choice of how to model unobserved time-invariant heterogeneity in SFA can have a substantive impact on the estimated size of inefficiency.

The dependent variable is tax revenue excluding social security contributions—given that these are not readily available for most LIDCs and their use as insurance schemes varies across countries. The main explanatory variables are GDP per capita in constant USD, GDP per capita squared, the size of the agriculture sector in percent of GDP, trade openness (imports plus exports in percent of GDP), government effectiveness, and the score of the perception of corruption in the public sector, all in natural logarithmic form. The inefficiency term is modeled as a random positive variable. These are a set of commonly used variables in the empirical literature (Bird, Martinez, and Torgler 2006, Cyan, Martinez-Vasquez and Vulovic 2013, Fenochietto and Pessino 2013) for which data have greater, but still imperfect, coverage. Summary statistics are shown in Annex Table 1.

**Annex Table 1. Summary Statistics**

Variable	Entire Sample					
	Obs	Mean	Standard Deviation	Minimum	Maximum	Source
Tax revenue	5,401	16.9	10.8	0.0	53.4	WoRLD
Constant GDP per capita in PPP	5,721	17,595.4	19,987.3	436.7	161,971.5	WEO
Agriculture % of GDP	5,415	13.2	12.4	0.0	79.0	WDI
Trade as percentage of GDP	5,195	85.5	53.1	0.0	442.6	WDI
Corruption perception index	5,189	0.5	0.3	0.0	1.0	QOG
Government effectiveness	4,296	0.0	1.0	-2.5	2.4	WDI
Voice and accountability perception index	4,329	49.1	28.7	0.0	100.0	WDI
Advanced Economies						
Tax revenue	1,082	24.6	8.3	9.0	50.3	WoRLD
Constant GDP per capita in PPP	1,137	44,005.6	19,656.6	9,600.9	161,971.5	WEO
Agriculture % of GDP	1,019	2.3	1.6	0.0	10.9	WDI
Trade as percentage of GDP	1,130	111.8	82.5	15.8	442.6	WDI
Corruption perception index	1,072	0.1	0.1	0.0	0.3	QOG
Government effectiveness	851	1.4	0.5	0.1	2.4	WDI
Voice and accountability perception index	874	84.4	13.6	33.3	100.0	WDI
Emerging Market Economies						
Tax revenue	2,715	16.6	8.9	0.0	48.4	WoRLD
Constant GDP per capita in PPP	2,892	15,883.7	15,198.7	996.9	111,454.1	WEO
Agriculture % of GDP	2,758	9.4	7.2	0.1	52.3	WDI
Trade as percentage of GDP	2,579	85.0	38.1	0.0	275.0	WDI
Corruption perception index	2,363	0.5	0.2	0.0	1.0	QOG
Government effectiveness	2,113	-0.1	0.6	-2.1	1.6	WDI
Voice and accountability perception index	2,156	47.3	24.8	0.0	93.7	WDI
Low-Income Developing Countries						
Tax revenue	1,604	12.1	7.3	0.4	53.4	WoRLD
Constant GDP per capita in PPP	1,692	2,773.7	1,739.3	436.7	14,233.9	WEO
Agriculture % of GDP	1,638	26.4	12.1	1.0	79.0	WDI
Trade as percentage of GDP	1,486	66.3	35.7	0.8	348.0	WDI
Corruption perception index	1,754	0.7	0.2	0.1	1.0	QOG
Government effectiveness	1,332	-0.9	0.5	-2.5	0.8	WDI
Voice and accountability perception index	1,299	28.2	17.7	0.0	87.0	WDI

The expected relationship with tax revenues is as follows: GDP per capita is the most used variable in the estimation of tax potential. It is a proxy for a country's economic development. A positive relationship is expected because of higher ability to pay in a society with higher income. GDP per capita squared accounts for a nonlinear relation between tax revenue and GDP per capita. The expected sign is negative implying that diminishing increases in tax revenue collection as income increases.

Agriculture as a share of GDP represents a hard-to-tax sector, which is often exempt from VAT and/or income taxes. Moreover, this sector is characterized by small producers (Fenochietto and Pessino 2013). Therefore, it is also a proxy for the informal sector. A negative relationship is expected. Trade openness captures the size of exports and imports in an economy. It has traditionally been considered as ambiguous given that a greater mobility of goods and factors of production largely represents increased mobility of the tax base, which potentially reduces revenues. However, more trade is associated with a more vibrant economy. Moreover, taxes on goods trade take place at few locations within a country and are relatively easy to collect, leading to larger revenues. Thus, a positive relationship with tax revenues is expected, as often found in the literature.

Finally, corruption is expected to have a negative relationship with tax revenue collection given its detrimental effect on tax morale and compliance.

### **Empirical Results**

Estimates of tax capacity and tax effort are derived from the comparison of the observed experience of other countries during approximately three decades. The purpose was to estimate the highest level of tax revenue observed given a country's economic structure and other prevailing conditions.

The findings from the preferred model are consistent with other empirical work (Annex Table 2, column 1). The sign and magnitude of the coefficients is robust to the inclusion of other variables such as a dummy variable for oil-producing countries and grants. The inclusion of oil was detrimental to the tax frontier as evidenced by the coefficients in columns (3) and (4). While the coefficient for grants in column (2) is positive and statistically significant, its confidence interval spans into negative figures, and it is therefore not possible to categorically assert that it does not reduce the tax frontier. The size and magnitude of the coefficients is robust to the inclusion of the perception of corruption model.

The inclusion of variables such as government effectiveness, a normalized variable with mean 0 which captures the perception of the quality of public services, the quality of civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, yielded unexpected results. It biased the sign and magnitude of the coefficients in the preferred specification (column 6). However, further examination shows a high level of correlation between GDP per capita and this variable. When the model was run without GDP per capita, government effectiveness exhibited the expected signs (column 5).

Annex Table 2. Stochastic Frontier Analysis Coefficients

Variables	(1)	(2)	(3)	(4)	(5)	(6)
ln_GDP per capita	2.418*** (0.0609)	2.625*** (0.0946)	2.497*** (0.0791)	2.754*** (0.133)		2.564*** (0.0755)
ln_GDP per capita squared	-0.127*** (0.00346)	-0.137*** (0.00527)	-0.131*** (0.00430)	-0.143*** (0.00746)		-0.134*** (0.00414)
ln_agriculture	-0.0583*** (0.00822)	-0.0309*** (0.0115)	-0.0563*** (0.00968)	-0.0379*** (0.0106)	- 0.1446*** (0.0146)	- 0.0633*** (0.0118)
ln_trade_gdp	0.148*** (0.0102)	0.0961*** (0.0131)	0.138*** (0.0109)	0.103*** (0.0119)	0.1290 *** (0.01571)	0.0944*** (0.00908)
ln_public sector corruption	-0.0707*** (0.00530)	-0.0835*** (0.00941)	-0.0197*** (0.00500)	-0.0547*** (0.00845)		
ln_grants		0.00542*** (0.00159)		0.00544*** (0.00155)		
ln_government effectiveness					0.1340** (0.0646)	-0.151*** (0.0492)
Oil			-0.842*** (0.0181)	-0.282*** (0.0219)		
Constant	-9.334*** (0.266)	-10.08*** (0.457)	-9.377*** (0.361)	-10.71*** (0.582)	3.005*** (0.1402)	-9.478*** (0.341)
Usigma	-3.318*** (0.0446)	-3.548*** (0.0539)	-3.323*** (0.0453)	-3.589*** (0.0554)	-3.055*** (0.0456)	-3.698*** (0.0554)
Vsigma	-5.179*** (0.0682)	-5.393*** (0.0823)	-5.166*** (0.0697)	-5.313*** (0.0814)	-5.328*** (0.0811)	-5.159*** (0.0748)
Number of observations	4,146	2,822	4,146	2,822	3,489	3,436
Number of countries	157	144	157	144	174	169

Source: Authors' calculations.

Note: Fitted using Stata's `sfp` command with the True Random Effect option. Usigma is the mean of  $u_{it}$ , and Vsigma is the mean of  $v_{it}$  in equation 3. Standard errors in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .





## PUBLICATIONS

**Building Tax Capacity in Developing Countries**

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