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The ICTD Government Revenue Dataset

Wilson Prichard, Alex Cobham and Andrew Goodall

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Summary

A major obstacle to cross-country research on the role of revenue and taxation in development has been the weakness of available data. This paper presents a new *Government Revenue Dataset* (GRD), developed through the International Centre for Tax and Development (ICTD). The dataset meticulously combines data from several major international databases, as well as drawing on data compiled from all available International Monetary Fund (IMF) Article IV reports. It achieves marked improvements in data coverage and accuracy, including a standardised approach to revenue from natural resources, and holds the promise of significant improvement in the credibility and robustness of research in this area. This paper sets out the issues with existing sources and explains the process of creating the new dataset, including a discussion of remaining limitations. It then presents data on tax and revenue trends over the past two decades, while a concluding section briefly considers potential strategies for, and barriers to, more effective data collection in future.

Keywords: tax; revenue; government revenue; data.

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Acronyms

AfDB	African Development Bank
AEO	African Economic Outlook
CEPAL	Comisión Económica para América Latina y el Caribe
CEPALSTAT	<i>Estadísticas de América Latina y el Caribe</i>
CIAT	Centre Interamericano de Administraciones Tributarias
CR	Country Report
GDP	Gross Domestic Product
GFS	<i>Government Finance Statistics</i>
GRD	<i>Government Revenue Dataset</i>
ICTD	International Centre for Tax and Development
IFS	<i>International Financial Statistics</i>
LCU	Local Currency Units
IMF	International Monetary Fund
OECD	Organisation for Economic Co-operation and Development
OxLAD	<i>Oxford Latin American Economic History Database</i>
SOE	State-owned Enterprise
VAT	Value Added Tax
WDI	<i>World Development Indicators</i>
WEO	World Economic Outlook
WTD	World Tax Database

Introduction

The last decade has seen growing interest in taxation as a key component of sustainable development through its impact on economic growth and its contribution not only to government revenue, but also to redistribution and the emergence of improved governance (Cobham 2005a). This has in turn been reflected in the relatively rapid expansion of research, including extensive cross-country econometric research, exploring, among other areas: the connections between taxation, non-tax revenue and good governance (Ross 2004; Mahon 2005; Timmons 2005; Haber and Menaldo 2011; Baskaran and Bigsten 2013); the impact of democracy, or of history, on taxation and the size of the state (Boix 2001; Cheibub 1998; Mkandawire 2010; Timmons 2010); the impact of tax reform and tax structure on tax revenue (Keen and Lockwood 2010; Keen and Mansour 2009; Aizenman and Jinjarak 2009); the impact of taxation and tax structure on growth (Acosta-Ormaechea and Yoo 2012; Adam and Bevan 2005; Lee and Gordon 2005); and the relationship between foreign assistance and domestic taxation (Gupta et al. 2004; Benedek et al. 2012; Clist and Morrissey 2011). To these questions can be added increasing recent interest in issues related to taxation and inequality (Gemmell and Morrissey 2005), and the scale of international tax evasion and avoidance (Cobham 2005b; Global Financial Integrity 2008; Fuest and Riedel 2009; Reuter 2012), as well as more theoretically-oriented research that has used global government revenue data to describe broad features of the process of statebuilding in developing countries (Besley and Persson 2011).

Unfortunately, this rapidly expanding body of research has been accompanied by a growing recognition of the stark limitations of available government revenue data for developing countries – so much so that significant scepticism exists about even basic descriptive data related to global and regional tax trends over time. The most widely used global data source has remained the IMF *Government Finance Statistics* (GFS). However, tellingly, many IMF researchers long ago abandoned reliance on this data owing to pervasive missing data and inconsistency in the treatment of natural resource revenue in particular (Baunsgaard and Keen 2005; Keen and Lockwood 2010; Keen and Mansour 2009). As researchers have increasingly abandoned IMF GFS data, they have instead relied on various regional datasets (Baskaran and Bigsten 2013),¹ ad hoc datasets constructed from country-level sources (Haber and Menaldo 2011), or ad hoc combinations of data from multiple sources (Benedek et al. 2012). For the purposes of research these alternative data sources are widely viewed as an improvement over relying on highly incomplete data from the IMF GFS. However, the proliferation of alternative datasets – and poorly documented adjustments to available data – has made comparison and replication difficult, thus further undermining confidence in the quality and robustness of key results.

In light of these limitations, this paper presents the newly created ICTD *Government Revenue Dataset* (GRD), which aims to overcome many of the weaknesses associated with existing datasets, and to provide a widely shared and comparable data source for researchers and policymakers. The first goal of the exercise has been to improve data coverage, which has been achieved by meticulously combining data from the most complete and reliable international sources. Among international datasets, the ICTD GRD draws primarily on the IMF GFS, the OECD *Tax Statistics* dataset and the *Revenue Statistics in Latin America* dataset constructed by the OECD, Comisión Económica para América Latina y el Caribe (CEPAL) and Centre Interamericano de Administraciones Tributarias (CIAT), while it draws to a more limited extent on data from *World Development Indicators*, CEPAL, the African Economic Outlook and a research database constructed by Keen and Mansour

¹ Most notably the OECD *Tax Statistics* (OECD countries), CEPAL dataset (Latin American countries) and Africa Economic Outlook dataset (for Africa).

(2009). In addition, the creation of the dataset has involved compiling data in a standardised format from all available IMF Article IV reports. This country-level data has, in turn, been used to fill significant gaps in the data available from international datasets.

Alongside improved data coverage, the ICTD GRD improves the accuracy of data for research purposes, most notably by imposing a standard approach to natural resource revenue. Available international sources generally do not distinguish between tax revenue from natural resource and non-resource sources. While this is accurate in a strict accounting sense, it is frequently misleading for researchers and policymakers, for whom the distinction between resource and non-resource revenue is critical. With this in mind, the ICTD GRD systematically distinguishes between resource and non-resource tax revenue, thus providing a clear and consistent picture of non-resource tax collection across countries – while providing detailed data on resource revenue wherever possible. This is achieved primarily, though not exclusively, by relying on more disaggregated data from IMF Article IV reports. Finally, additional improvements in accuracy are achieved by: systematically comparing data from alternative sources for every country-year, in order to remove potential errors; dealing systematically with social contributions; compiling data at both the central and general government levels; and, critically, employing a standard and up-to-date GDP series.

The process of merging data from multiple international sources implies inevitable imperfections owing to differences in methods and the occasionally subjective nature of data choices. However, we contend that the benefits of this exercise dramatically outweigh the costs, while the transparency of our process ensures that every data choice will be open to scrutiny by future researchers. The end result is a dataset that achieves dramatic improvements in coverage and accuracy relative to existing international sources, and which is also substantially more complete, accurate and transparent than any other effort to construct a composite dataset from existing sources.² Table A3 in the Appendix provides an overview of the improved data coverage offered by the ICTD dataset relative to available alternatives – and distinct from the still more important improvements in accuracy that it offers.

The paper is structured as follows. The first section describes the limitations of existing data in greater detail, and highlights some examples of their research consequences. The second section describes the construction and cleaning of the dataset in detail, walking the reader through the classification system employed, the data sources on which we draw, and the justification for, and approach to, merging data from multiple alternative sources. The third section considers the continuing, and currently inescapable, limitations of cross-country government revenue data. The fourth section then presents a descriptive analysis of tax and revenue trends over time, across tax types, income groups and regions. The final section concludes, with a focus on recommendations for improving the quality of government revenue data collection in the future.

1 The need for a new government revenue dataset

There are currently a number of available sources of cross-country tax and revenue data from organisations including the IMF, the OECD, the World Bank and CEPAL (discussed in greater detail below). However, these sources are frequently not consistent with one another,

² The most notable of these composite datasets is that developed by the IMF Fiscal Affairs Department and employed, among others, by Benedek et al. (2012).

and each suffers problems of coverage, accuracy or both. Reflecting these problems, individual researchers have increasingly sought to compile their own datasets either by merging multiple data sources (e.g. Benedek et al. 2012), or returning to country-level sources (e.g. Haber and Menaldo 2011). Most tellingly, researchers from the IMF itself have increasingly relied on the construction of their own datasets from country-level sources, rather than using the organisation's *Government Finance Statistics* (GFS) (Keen and Mansour 2009; IMF 2012). These efforts have generated data for individual studies that is superior for research purposes than the GFS alone. However, they have been comparatively ad hoc, poorly documented, not broadly available, and generally targeted towards specific research challenges – and thus not easily transferable across studies. What follows thus considers, in turn, the limitations of existing international sources, the consequences of these limitations for research, and alternative international efforts to improve on these existing options.

1.1 The limitations of existing data sources

Conceptually, the most important limitations of existing data sources can be usefully divided into five elements: (a) coverage, (b) quality and consistency, (c) reporting and comparability, (d) limited attention to non-central levels of government, and (e) inconsistent and inaccurate GDP figures.

1.1.1 Coverage

Existing data sources are characterised by extensive missing data and gaps in coverage. Some regional databases achieve significant data coverage within those regions (e.g. OECD, CEPAL and African Economic Outlook (AEO)). However, they are only available for OECD countries, Latin America and Africa, and are thus inadequate for broader international comparison. Moreover, data series for Latin America and Africa are limited to the period from 1990 onwards, while both the OECD and CEPAL tax databases require information on non-tax revenue to be retrieved from separate data series, which are sometimes either inconsistent or incomplete. Meanwhile, cross-country databases from the IMF and World Bank cover only approximately 65 per cent and 50 per cent of potential country-year observations for the period 1990-2010, respectively, with coverage generally declining further for lower-income countries and in earlier years (Table A3).³ This is particularly problematic because missing data is non-random, and often concentrated in countries experiencing instability, weak governance or a poor relationship with international organisations.

1.1.2 Quality and consistency

Alongside problems of coverage there are frequently substantive differences in the data available from different data sources. In some cases these differences appear to be driven by methodological choices, as unique features of individual national tax systems may lead to ambiguity about appropriate classification, and differences in the resulting classification across sources. While these differences are not 'errors' in any sense, they can be substantial. Of somewhat greater concern are a wide range of cases in which differences across sources are substantial and are non-systematic, as in these cases differences across sources are difficult to explain. An illustration of these potential challenges comes from Brazil in 1993, as tax revenue figures (exclusive of social security) vary substantially from source to source: BRL 1,115 million in the IMF Article IV Report, BRL 1,480 million in the GFS dataset, BRL 1,765 million in the CEPAL dataset and BRL 1,825 million in the OECD dataset. Tax

³ While many of the datasets cover earlier periods as well – and these earlier periods are included in the ICTD GRD – we focus on the period 1990-2010 for illustration because this is the period over which all of the data sources are available, and thus amenable to illustrative comparison.

data from Argentina in 2002 follows a similar pattern: ARS 32,100 million in the IMF Article IV report, ARS 23,327 million from the IMF GFS Budgetary Central Government dataset, ARS 30,092 million from the IMF Consolidated Central Government dataset, and ARS 28,045 million in the CEPAL and OECD datasets.⁴

In these cases there may be no simple answer to the question of which source is unambiguously correct or preferable. Depending on one's perspective, these differences are suggestive both of the dangers inherent in merging data from different sources (and the need to ensure in any individual case that merged data 'matches'), and of the importance of comparing different data sources in order to identify unusually divergent data within any individual source. In most cases, in the absence of a clear 'right' answer, a pragmatic response is to focus on consistency (at least within countries) and to create transparency across sources about these differences. One of the goals of the new ICTD dataset is correspondingly to make these differences across sources more visible, by allowing for easy comparison of data points from different sources.

1.1.3 Reporting and comparability

While comparing different data sources thus reveals substantive, and often difficult to explain, differences in individual data points, these differences tend to be relatively modest. By contrast, more dramatic problems with available data – and with efforts to merge data from multiple sources – can be traced to deeper methodological challenges and differences across sources.

The most important and challenging issues arise in relation to the treatment of natural resource revenue. Both countries and sources vary dramatically in whether revenue from the natural resource sector is recorded as tax or non-tax revenue, and it is almost always impossible in international databases to distinguish between the resource and non-resource components of different revenue categories. The consequences for research and policy are significant: without distinguishing between resource and non-resource sources of revenue it is impossible to understand the extent to which a government is extracting tax revenue from its own citizens, to understand the composition of government revenue in a meaningful way, or to assess potential threats to fiscal balance.

The case of Iran provides perhaps the most striking illustration of the depth of this problem. Pre-1990 IMF GFS data (based on the 1986 *GFS Manual* (IMF 1986)) saw resource revenue classified as tax revenue, while post-1990 IMF GFS data saw tax revenue reported exclusive of resource revenue. This results in a major break in the data series. Similarly, in Ecuador the IMF GFS records tax revenue 75 per cent higher than the CEPAL dataset owing to different choices about the inclusion or exclusion of resource revenue in tax revenue. In Angola, adherence to the IMF GFS or the AEO fiscal indicators yields tax collection figures over the past two decades ranging from 30-50 per cent of GDP, whereas non-resource tax collection – which is the more analytically useful category in most cases – amounts to less than 10 per cent of GDP in all years, and less than 5 per cent in some. The range of such cases in existing data is extensive, and in many cases makes cross-country analysis fundamentally misleading.

⁴ A more extreme example comes from the IMF GFS data for Iran, which indicates total government revenue that exceeds 100% of GDP from 1987-1989 when combined with GDP data from the *International Finance Statistics*. In slightly different fashion, there is massive volatility in data for countries of the former Soviet Union in the early 1990s. For a variety of other cases official data suggests implausibly high levels of revenue collection, or marked swings in revenue collection from year to year, with this often related to a disjuncture between official revenue figures and official GDP figures, as discussed below.

In general, countries record corporate taxes paid by private sector resource companies as taxes, while recording royalties, export taxes, profit sharing and the profits of state-owned enterprises (SOEs) as non-tax revenue. However, this pattern is not strictly adhered to across sources, and is often not consistent over time within IMF Article IV reports. Irrespective of the specific reasons for these differences in allocation, they can make available data virtually meaningless for analytical purposes – it obscures the actual level of extraction from citizens, it makes meaningful comparison involving resource-rich countries impossible, and it distorts trends over time. As it stands, some resource-rich countries appear to be among the most successful tax collectors globally, while others appear to collect very limited tax revenue – and this varies across sources. Meanwhile, increases or decreases in taxes may reflect shifts in the fiscal framework for resource revenue, or the reallocation of revenue between the tax and non-tax categories, rather than changes in the extractive capacity of states.

The treatment of social contributions is more straightforward, but still critical: both countries and data sources vary in whether social contributions are included in revenue statistics at all, and, in turn, whether they are classified as tax revenue, direct tax revenue, or neither of the two. With social contributions amounting to as much as 20 per cent of government revenue in some cases, these classification choices can have a huge implication for interpreting the extractive capacity of states – and can lead to major inconsistencies in seeking to draw comparisons across countries, or even within countries over time. This is generally not a problem within individual data sources, but is an important (and often overlooked) issue when combining or comparing data from multiple sources. Thus, for example, when merging IMF GFS data from the pre-1990 and post-1990 periods, social contributions are included in tax revenue in the earlier period, but not in the latter. Similarly, IMF Article IV reports are inconsistent in their recording choices, thus necessitating care in drawing on data from different reports.

1.1.4 Levels of government

While the issues above have been increasingly widely acknowledged, a more often overlooked issue relates to researchers' frequent reliance on central government data for the purpose of analysis. The motivation for this focus is straightforward: central government data is more widely available, whereas general government data is most often not available for lower-income countries owing to the absence of data from local government. However, while pragmatic, a focus on central government data can be misleading for federal states, where large shares of government revenue are collected at the state/provincial and local levels. A focus on central government revenue vastly understates revenue collection in states like India, Brazil and Nigeria, while it can also obscure trends in revenue over time if revenue assignment across levels of government changes. So, for example, in Brazil central government tax revenue hovered at around 15 per cent of GDP during the 2000s, which would place it among the lowest tax collectors in South America, whereas general government data reveals total tax collection around 25 per cent of GDP, which is among the highest in the region and more indicative of the reality in the country.

1.1.5 GDP series

While there are thus significant challenges with available revenue data itself, additional inaccuracy and incompatibility is frequently introduced by differences in the GDP series employed to calculate tax ratios. Modest problems can arise from small but frequent differences in GDP series across sources. These differences highlight the need for any analysis to pay explicit attention to the GDP series being employed – something which is frequently not the case. It equally suggests that when data is merged from multiple sources a constant GDP series should be applied – lest 'jumps' in the data result from differences in GDP series across sources. Meanwhile, much larger and more troubling problems can arise

from the irregular rebasing of GDP, which can drive major overestimation of tax-to-GDP figures as well as abrupt breaks in the data series being employed.

Base year data is used to establish the share of different activities (e.g. agriculture and manufacturing) in a country's total GDP. Current data on growth in each sector is then combined with this information on shares to create GDP series. Rebasing has major implications in economies where the share of different activities has changed substantially over time (say, for example, manufacturing has grown rapidly at the expense of agriculture). Major readjustments of GDP estimates – potentially as large as 50 per cent – are therefore possible. Thus, for example, rebasing in Ghana in 2010 resulted in a 60 per cent 'increase' in GDP, while rebasing in 2014 in Zambia and Nigeria has resulted in increases of 25 per cent and 90 per cent, respectively.⁵ The importance of frequent rebasing (at, e.g., 5-year intervals) to avoid major distortions is widely acknowledged, but may not be prioritised when – as is often the case – statistical resources are tightly constrained.

By driving the underestimation of actual GDP, infrequent GDP rebasing can result in significantly inflated tax-to-GDP ratios. This alone implies a need for caution in conducting research using cross-country data, and the need for care in comparing reported levels of tax collection across countries, regions or income groupings. However, while the underestimation of GDP is thus a major consideration on its own, the problem is magnified by the fact that international sources sometimes use GDP series for the same country with different base years (Jerven 2013a). Inconsistency in GDP series results in rapid shifts in tax-to-GDP ratios at points of discontinuity in underlying GDP series – even in those situations where the underlying tax data is consistent.

This was, for example, the case in Ghana, where the reported tax-to-GDP ratio exceeded 20 per cent, before rebasing in 2010 saw a large upward adjustment in GDP – and a corresponding fall in the reported tax ratio to less than 13 per cent of GDP. Critically, this discontinuity persists within some international datasets: within the IMF *International Financial Statistics* (IFS), the 2010 rebasing exercise is only reflected in GDP data from 2006 onwards, thus resulting in a dramatic break in the GDP series after 2005 – and a subsequently dramatic fall in the reported tax-to-GDP ratio when employing IFS GDP data. A more dramatic, and difficult to understand, illustration comes from Iran. When tax and revenue data for the IMF GFS is paired with the IMF IFS GDP series, the result is an apparent increase in total government revenue from 26 per cent of GDP in 1982 to 119 per cent of GDP in 1989. In both cases these risks to research are not merely abstract: these specific data errors appear in the data employed for recent and high profile research which draws on an internal IMF database (Benedek et al. 2012).

1.2 Consequences for research

The impact on research of the absence of high quality data is reflected in inescapable, and serious, concerns about results that rely on existing sources, as well as the proliferation of competing research outputs each relying on its own, frequently ad hoc, dataset. This latter problem is little talked about, but very significant: as many existing results are not comparable, data cannot be interrogated effectively and it is in some cases difficult or impossible to replicate existing results. While the introduction of new regional datasets for Africa and Latin America in recent years has improved data quality for some subsets of countries, it has not addressed problems relating to the inconsistent treatment of resource revenue, and has exacerbated the problem of different researchers employing different data, thus producing non-comparable results. To briefly illustrate the nature and extent of these concerns, it is useful to consider two research areas that have been the subject of

⁵ Jerven (2013a); Cobham (2014); Mukanga (2014); Leo (2014).

preliminary ICTD research using the ICTD GRD: (a) the connections between foreign aid and tax effort, and (b) the connections between taxation, non-tax revenue and accountability.

1.2.1 Foreign aid and tax effort

Researchers have long asked whether large flows of foreign aid might reduce the incentive for recipient countries to collect domestic tax revenue, in much the same way as access to natural resource wealth. This is, moreover, a seemingly straightforward proposition to test econometrically, at least in its simplest form: empirically, do countries actually collect less tax revenue when they receive more aid?

In practice this has become a highly contentious research question, and an important part of that tension has been driven by imperfect data, inconsistent data choices, and a lack of comparability across studies. The most widely cited study is that of Gupta et al. (2004), who reported evidence that aid grants have a statistically significant negative impact on domestic tax collection, while loans do not have the same negative impact. This finding was subsequently replicated by Benedek et al. (2012), drawing on an internal dataset employing a combination of IMF data (from multiple sources) and OECD data. These findings have significant policy implications, as they represent an important argument against the provision of grants to low-income countries. However, research by Clist and Morrissey (2011) and Carter (2013) has called that research finding into question, based on the application of other publicly available data, more sophisticated methods, and an acknowledgement that the relationship may have shifted over time.

This debate reflects differences in methodological approach, but has also reflected differences in data. Carter (2013) is forced to consider all his results separately for multiple alternative datasets, reflecting the relative lack of easy comparability across studies. This included the datasets employed by Gupta et al. (2004) and Benedek et al. (2012), neither of which is publicly available, though in both cases the authors were willing to share the data privately. In a more recent contribution, Clist (2014) attempted to replicate the results reported in Benedek et al. (2012), and uncovered major concerns about the accuracy of the dataset underlying the results (discussed in more detail below). He, in turn, discovered that the results were not robust to using alternative data or alternative methods. Morrissey et al. (2014) have subsequently employed the new ICTD GRD to test the relationship between aid and tax effort, and similarly find that there is no significant relationship.

Ultimately, this literature has seen the application of increasingly sophisticated econometric models, amidst continuing disagreement about results. However, in practice the major threat to the credibility of earlier results has lain not in the weakness of the econometric approaches, but in the inconsistency of the underlying data on which these studies have been based. The work of Morrissey et al. (2014), drawing on the ICTD GRD, thus represents an opportunity to overcome this impasse.

1.2.2 Taxation, non-tax revenue and accountability

Burgeoning research into the political ‘resource curse’ – which posits a negative relationship between reliance on resource revenue and political accountability – offers a similar illustration of existing data challenges. Ultimately, the most important theories of the resource curse are ultimately about government revenue, as governments with greater *revenue* from natural resources are expected to be less accountable to their citizens. However, owing at least in part to the weakness of cross-country revenue data, most existing studies have relied instead on more readily measures of the *value of resource production* to test the relationship (e.g. Ross 2001; Aslaksen 2010; Haber and Menaldo 2011). Put simply, the limitations of cross-country government revenue data have undermined the ability of researchers to test

the causal relationship of interest precisely, while contributing to continuing controversy about the existence, or not, of a resource curse.

Meanwhile, a handful of studies have sought to employ government revenue data – but the quality of the results is called into question by the low quality of that data. Ross (2004) offered the first major cross-country econometric test of the relationship between the composition of government revenue and democracy, and reported highly influential evidence of a positive relationship between tax reliance and accountability. However, his dataset – drawn from the IMF GFS and World Bank *World Development Indicators* – captured only about half of possible observations for developing countries, while it failed to account consistently for the inclusion of resource revenue in reported tax revenue. Timmons (2005) provided additional results supportive of the idea of ‘fiscal contracts’, but again relied on highly incomplete data from the IMF and World Bank. Morrison (2009) subsequently reported a different set of conclusions, arguing that greater access to non-tax revenue does not reduce democracy, but simply increases the stability of both democracies and autocracies alike. However, he similarly relied on data from the IMF GFS, thus calling the reliability of the results into question.

Recognising the weaknesses of available data, Haber and Menaldo (2011) followed an alternative strategy, pursuing an ambitious effort to gather more complete data from country-level sources. However, they collected government revenue data for only a subset of eighteen resource-rich countries, thus limiting the completeness of their results. Meanwhile, their reliance on country-level sources – while impressive – implies inescapable concerns about the possibility of different methodologies across countries, and about the barriers to other researchers expanding upon their dataset.⁶ In a separate study, Baskaran and Bigsten (2013) have published tests linking taxation and accountability by drawing on the new AEO *African Fiscal Performance*. However, while the AEO database provides relatively complete data, it raises a variety of limitations: there is no scope for comparison with other regions, it covers a comparatively brief time horizon, and offers limited comparability to other studies owing to differences in data across sources.

Again, the bottom line is that inconsistent and imperfect data has sharply limited the persuasiveness and completeness of existing results. In an effort to address these uncertainties, Prichard et al. (2014) have employed the ICTD GRD to provide the first tests of the connection between tax revenue, non-tax revenue and democracy using relatively complete and reliable data across countries. They find significant support for the contention that states that are more reliant on non-tax revenue, primarily from natural resources, are less like to be democratic – while finding no evidence that non-tax revenue has the stabilising effect suggested by Morrison (2009). Not only are these findings more robust than those of earlier studies, but they are also easily replicable owing to the public availability of the data.

1.3 Alternative international efforts

The problems discussed here are widely recognised, and the status quo for research is widely viewed as inadequate, but there has been limited progress. Serious discussions within the IMF about improving data quality appear to date back a decade or more, but actual progress has been very slow. Interviews with those involved suggest that this has reflected, among other factors, limited resources, poor cooperation between different divisions within the organisation, and, potentially, a reluctance to acknowledge the limitations of existing data publicly. To this can be added the different incentives and interests of the statistics

⁶ To their great credit, Haber and Menaldo have been extremely forthcoming in making their data available to other researchers. However, because of reliance on country-level sources, and unique methodologies across countries, it is very difficult for other researchers to return to original source materials, or to build upon the dataset.

departments that collect data and those who use it for policy and research. The former tend to focus more heavily on the finer details of data quality, while approaching categorisation from primarily an accounting perspective. Meanwhile, the latter (including the initiative described here) are generally more interested in ‘good enough’ data, and on data structures that capture key analytical distinctions (as with the distinction between resource and non-resource revenue). Again there are no strictly right answers, but, ideally, a need for flexible approaches that can accommodate both sets of considerations.

This is not, however, to suggest the total absence of progress in improving data quality. Within the IMF, efforts have been ongoing within the Statistics Department to review and improve the quality of the IMF GFS data to the extent possible. More ambitiously, a template has been developed to allow for much more systematic collection of data on natural resource revenue, with a view to drawing consistent distinctions between the resource and non-resource components of key revenue categories. Meanwhile the Fiscal Affairs Department has pursued an initiative, similar to the dataset described here, to merge data from multiple different sources (IMF GFS, World Economic Outlook, OECD and Article IV reports) in order to improve data coverage.

These initiatives are all very welcome, but are not a substitute for the ICTD GRD. Efforts to improve the IMF GFS, and particularly to collect data on natural resource revenue systematically, are extremely valuable – but it appears likely to be at least a decade until that work yields a sufficiently long time series for many types of analysis. Meanwhile, the composite dataset that has been developed internally by the Fiscal Affairs Department, and used in recent research, is less ambitious than the ICTD GRD. It does not systematically account for resource revenue or for inconsistent GDP series, nor has it involved the same level of manual cleaning of the merged data (described below). As a result it continues to suffer from important conceptual problems and inaccuracies, as reflected most notably in Clist (2014).

The OECD has also begun to move beyond its traditional focus on OECD countries in order to gather government revenue data for non-OECD states. The first such initiative was a partnership with CEPAL to construct the *Revenue Statistics in Latin America* database; this draws to a significant extent on existing CEPAL data but re-classifies it according to the OECD classification system – which is slightly distinct from, though compatible with, the IMF system of classification. The OECD, through the AEO, has also supported the collection of tax data across all African countries, though the scope of that data is more limited. More recently it has initiated more ambitious efforts to collect more detailed and systematic data from developing countries, following the OECD system of classification (Pierre 2013). However, while these initiatives point towards a very welcome OECD interest in improving the quality of official data, there remain challenges: these are long-term projects with uncertain prospects for markedly improving data quality⁷ or of achieving global coverage, while there are obvious concerns about a lack of coordination between the OECD and IMF.

Initiatives by the IMF and OECD to collect higher quality and more complete government revenue data unquestionably offer the greatest prospect for a long-term improvement in data quality. As importantly, meaningful progress has been made, and appears to be accelerating. However, these are long-term projects with still uncertain prospects, and in the interim research and policymaking would have had to continue to rely on an inadequate foundation. Against this background the ICTD GRD achieves an unambiguous and immediate

⁷ The OECD initiative aims to collect high quality data following a standardised OECD classification; such high quality and standardised data is in principle highly desirable. However, there remain questions about whether national governments with often weak statistical departments will be able to provide sufficiently high quality historical data – and thus about whether the historical data collected by the OECD will necessarily be of higher quality than what already exists, or what can be achieved by carefully drawing on multiple existing sources.

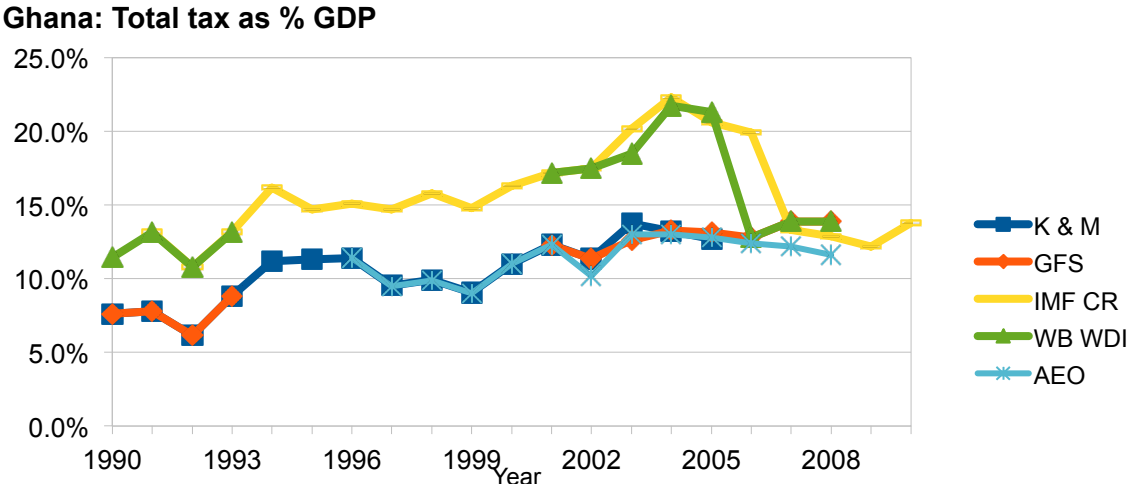
improvement in the quality of available historical data, while it has the potential to offer insights into future needs and to act as a potential catalyst for more rapid progress.

2 Construction of the dataset

Against this background, the construction of the ICTD GRD has been based on the careful compilation, merging and cleaning of data from multiple existing data sources, in order to arrive at a markedly more complete and accurate dataset. The potential of such a strategy is illustrated in Figure 1, which presents overlapping data coverage from different sources (but also data differences) for Ghana from 1990 to 2010. The graph illustrates both the potential for merging datasets in order to close gaps in the data, and the extent to which data varies across sources – with the largest discrepancies arising from differences in underlying GDP series.⁸

The effort undertaken in creating the ICTD GRD mirrors to some extent the construction of the IMF Fiscal Affairs Department dataset employed by Benedek et al. (2012), but exceeds that effort in several important ways.⁹ First, we draw more extensively on data from IMF Article IV reports in order to fill gaps in other international datasets. Second, we use those same sources in order to be able to deal systematically with natural resource revenue, thus making the data more accurate, consistent and analytically meaningful. Third, we rely on a common GDP series throughout, thus smoothing potential discontinuities in the data. And, finally, we pursue much more detailed manual cleaning of the data, in order to ensure compatibility across sources and the overall accuracy of the data.

Figure 1 Alternative data sources for Ghana 1990-2010



Notes: Authors' calculations. GFS denotes IMF *Government Finance Statistics*, coupled with the IMF WEO GDP series. IMF CR denotes IMF Country Reports, encompassing IMF Article IV reports and statistical appendices, and based on GDP figures contained in those reports. AEO denotes the African Economic Outlook dataset, which reports figures as shares of GDP, though with some ambiguity about the source of underlying GDP figures. WB WDI denotes the World Bank *World Development Indicators*, combined with the GDP series from the same source. K & M denotes the dataset developed by Keen and Mansour (2009), coupled with the WEO GDP series.

⁸ Note, in this figure the IMF GFS figures are based on the application of the IMF World Economic Outlook (WEO) GDP series. Application of the IMF IFS GDP series would cause GFS data to more closely resemble data from IMF Country Reports (IMF CR).

⁹ Indicative of the limitations of this (and other) earlier efforts, Carter (2013) draws on data from this internal dataset developed by the IMF Fiscal Affairs Department but notes several problems within that data, led by a major change in data classification for Iran before and after 1990. Clist (2014) assesses the composite data employed by Benedek et al. (2012), and similarly finds major jumps and inconsistencies in the data revolving around the combining of multiple data sources.

More formally, the construction of the dataset has involved six broad stages. First, the development of a standard classification scheme that can accommodate data from multiple different sources, while capturing critical new information about the extent of natural resource revenue. Second, a survey of existing cross-country datasets, led by those compiled by the IMF, OECD and CEPAL. Third, the systematic compilation of data from IMF Article IV reports, which makes it possible to fill gaps in international datasets and, most critically, to disaggregate the resource components of reported tax and non-tax revenue. Fourth, the adoption of a common GDP series, in order to eliminate discontinuities or errors arising from problems with the GDP series underlying some existing international sources. Fifth, the careful merging of data from these alternative sources into a single dataset. While the initial goal had been to automate this latter task, in practice ensuring data accuracy has required the careful manual cleaning of the data, coupled with careful documentation of the choices made. And, finally, developing a composite dataset that draws on both central and general government data as appropriate in order to provide the most accurate possible picture of national revenue collection.

2.1 Developing a standardised revenue classification

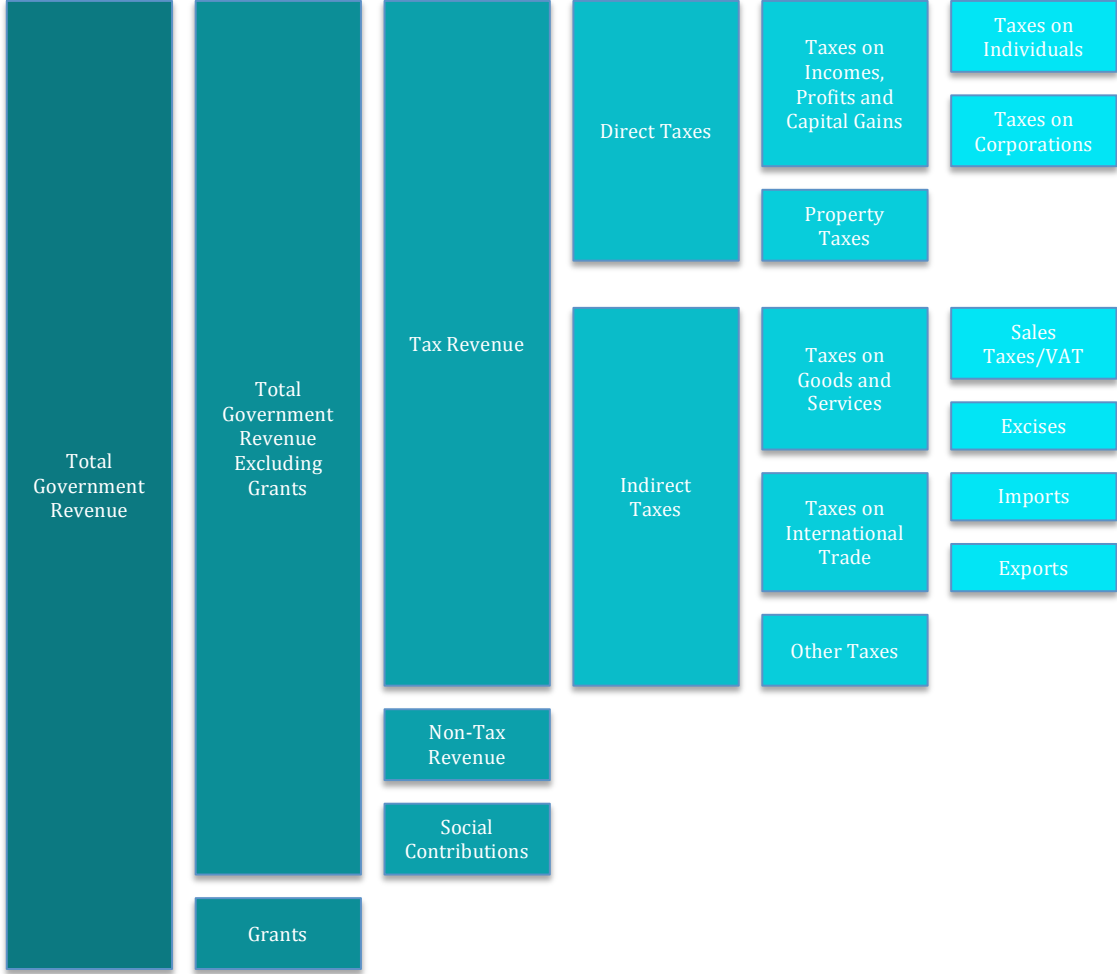
There are modest, though important, differences in the tax and revenue categories reported by different sources and, at times, in how revenue is categorised. The latter is an issue to be addressed through greater coordination among international organisations, but is beyond the scope of this project. That said, it does highlight the importance of caution when data from different sources is merged, as sources may differ in how they categorise the sub-components of tax revenue, even where they agree on the aggregate level of tax collection. The more important goal here has been to arrive at a revenue classification that takes fullest advantage of data from different sources, and which also maximises consistency across those sources in the categorisation of revenue.

In doing so, an important starting point is an acceptance that, for low-income countries in particular, the quality of government data is sufficiently limited, and difficulties of consistent classification sufficiently significant, that highly disaggregated data is not a realistic goal. This is reflected, for example, in the fact that most countries continue to report data to the IMF on a cash and budgetary basis, despite a formal shift in the *IMF 2001 Government Finance Statistics Manual* towards reporting on an accrual basis. The goal is thus not to have perfect data, but to have good enough data for analysis – by which we mean that it is generally consistent over time, free of obvious discontinuities, and that the classification of revenue to different sub-components of taxation is consistent at least at a relatively high level of aggregation.

With these constraints in mind, the foundation for the ICTD dataset is a classification system that closely mirrors the primary revenue categories collected by the IMF, but which adds two additional composite categories: direct taxes and indirect taxes. These additional categories are useful in that they are relatively easily constructed from available data (Figure 2), but by virtue of their high level of aggregation can overcome occasional differences across sources in the allocation of revenue between the sub-components of direct and indirect taxes, which can make these more aggregated categories more consistent and complete over time and across sources.¹⁰

¹⁰ This is most apparent when attempting to classify data from IMF Article IV reports consistently over time, while it is also reflected in the fact that the sub-components of tax revenue often do not perfectly add up owing to the difficulty of classifying some types of revenue.

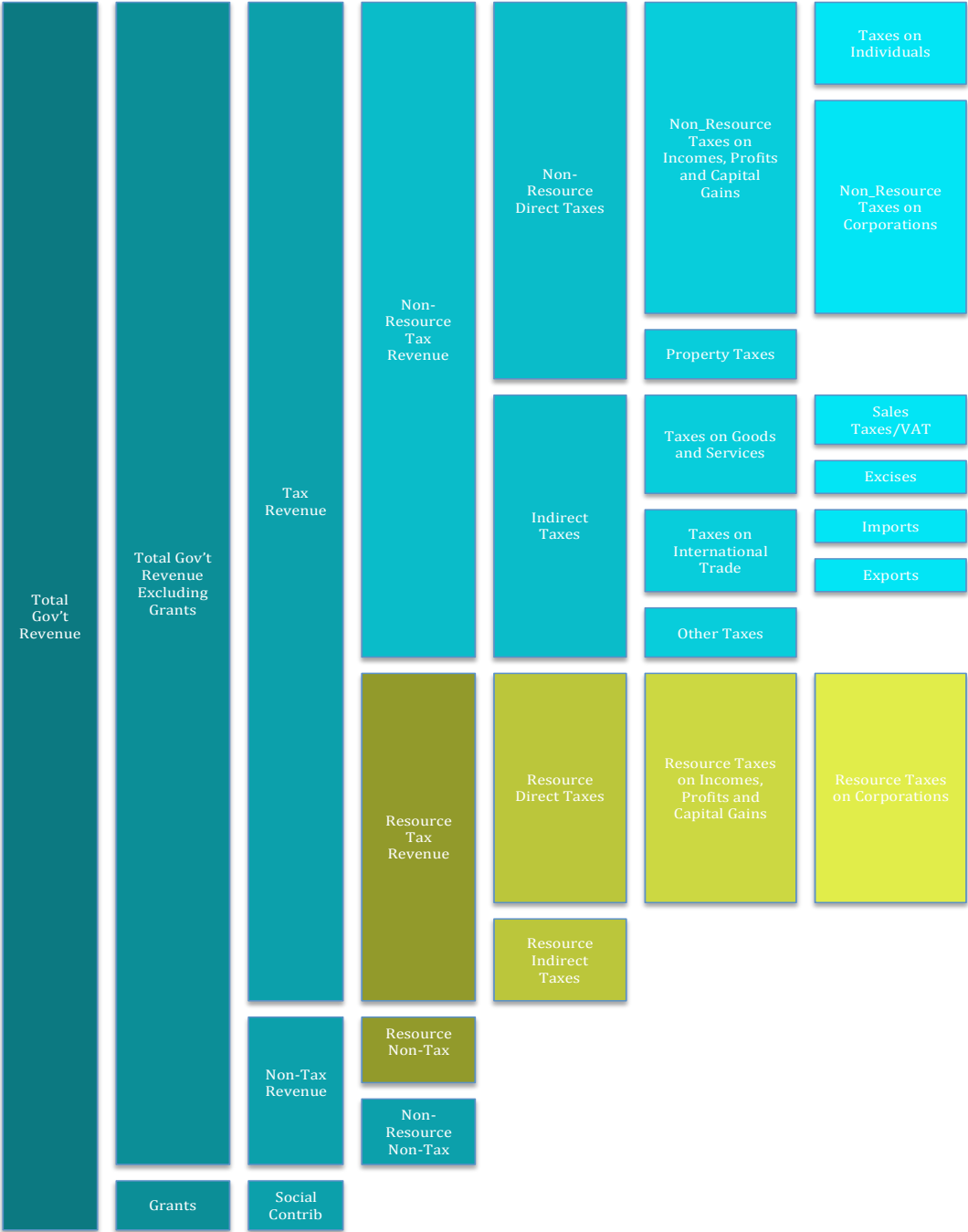
Figure 2 Basic revenue classification scheme for ICTD GRD



However, while these relatively common revenue categories provide the foundation for our classification, they fail to provide a standard format across sources for the classification of natural resource revenue and social contributions. In response, the primary innovation of our classification scheme is to report relevant revenue categories inclusive and exclusive of natural resource revenue and social contributions. With respect to resource revenue, this means that wherever a tax figure includes a resource component, that resource component of tax revenue is explicitly separated out in order to yield three distinct variables: total tax revenue, the resource component of tax revenue, and the non-resource component of tax revenue. Because resource revenue is frequently included not only in aggregate tax revenue, but in taxes on corporations, taxes on income, profits and capital gains, direct taxes and indirect taxes, each of those revenue categories is similarly divided into its resource and non-resource components.¹¹ In the same vein, wherever possible non-tax revenue is divided into its resource and non-resource components. This further disaggregation is depicted in Figure 3.

¹¹ There are a few cases in which resource revenue is recorded in other revenue categories – most commonly trade taxes or taxes on goods and services. Because these cases are very rare we have not constructed a distinct set of categories to capture the resource and non-resource components of revenue in these categories independently. Instead, where possible we have excluded the resource component of, for example, trade taxes, and reclassified that revenue as the resource component of non-tax revenue. In the few cases where this has not been possible we have included a flag in the dataset to indicate that the sub-components of indirect tax revenue are ‘contaminated’ by resource revenue.

Figure 3 Expanded revenue classification scheme for ICTD GRD



With respect to social contributions, the 2001 IMF classification system treats social contributions as a separate category, distinct from tax revenue. However, other sources frequently treat social contributions as tax revenue, and as a component of direct taxes. Meanwhile, in Article IV reports in particular some countries do not report social contributions as a component of government revenue at all, instead reporting them entirely separately or not at all. Rather than simply removing social contributions from these tax categories, which would potentially obscure the relationship between underlying sources and the final dataset, we instead opt to present total government revenue, total tax revenue and total direct tax revenue inclusive and exclusive of social contributions in the core dataset. That said, the revenue categories that are exclusive of social contributions are most complete across countries, given inconsistent reporting of social contributions.

2.2 Surveying available datasets

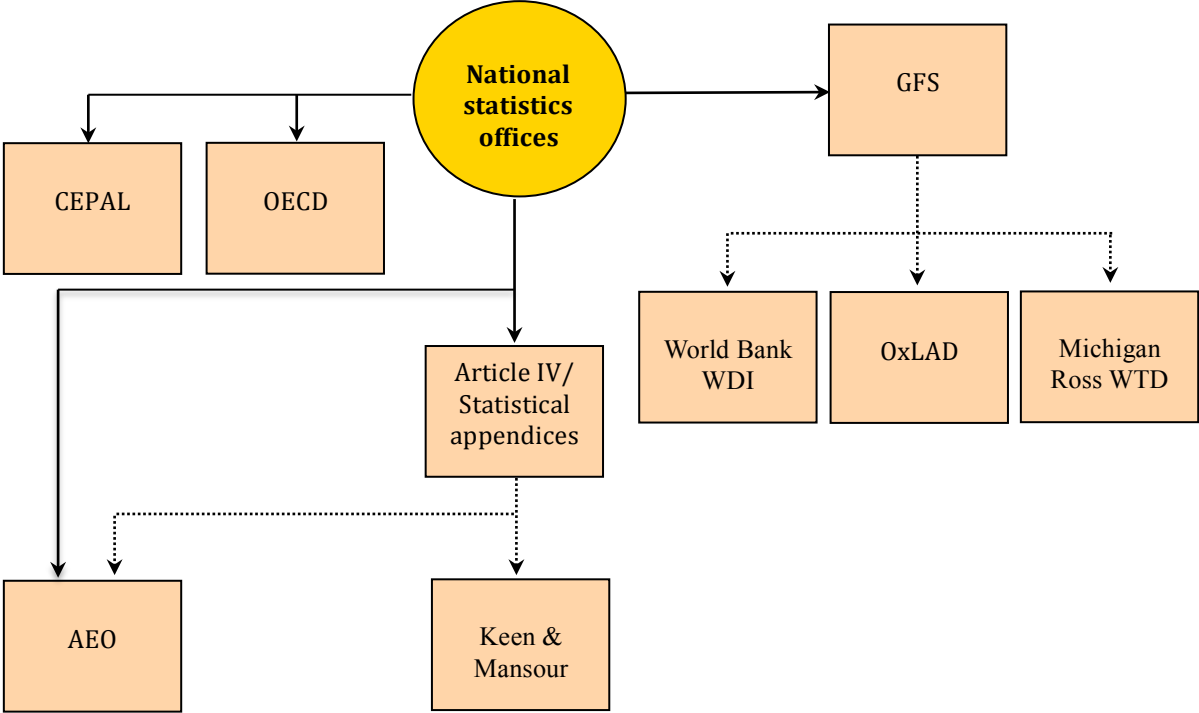
Having arrived at a core system of classification, the starting point for the construction of the dataset itself has been a survey of available international sources, and their compilation according to our common classification. Ultimately, the ICTD GRD has drawn on six cross-country datasets provided by leading international organisations: IMF *Government Finance Statistics* (GFS), World Bank *World Development Indicators* (WDI), OECD *Tax Statistics*, OECD *Revenue Statistics in Latin America* dataset, CEPAL *Tax Statistics*, and the AEO *African Fiscal Performance*.¹² The IMF GFS database underwent a change in methodology post-1990, and pre- and post-1990 data was gathered and incorporated into the dataset separately in order to ensure consistency.¹³

In addition, three datasets developed by researchers have been included in the survey of possible sources: Keen and Mansour (2009), which is based on IMF Article IV reports, the Michigan Ross School of Business *World Tax Database* (WTD) and the *Oxford Latin America Economic History Database* (OxLAD). For the most part these latter datasets have not been included in the final version of the ICTD GRD, as they are superseded by the standard international sources and/or country-level data collected directly from IMF Article IV reports (discussed below). The most interesting is the Keen and Mansour dataset, which occasionally contains figures that we have been unable to obtain from publicly available Article IV reports. This extra data makes it potentially very valuable, but because it does not cover all revenue categories, and includes a unique categorisation of trade taxes, it is in practice relatively difficult to incorporate. Figure 4 provides an indication of the ways in which the different data sources are connected.

¹² The most notable exclusion from this list is the World Economic Outlook (WEO) dataset, which provides total tax figures but does not include more disaggregated revenue data.

¹³ There are differences, most notably across the pre- and post-1990 data in the recording of social contributions and natural resource revenue.

Figure 4 Sources for revenue data



Note: CEPAL gives a partial account of its sources when they are national statistics offices; its sources otherwise are not indicated (but may be WEO and/or GFS). The source for Michigan Ross WTD is not indicated but clearly derives from GFS. For OxLAD the source is identified as GFS/IFS for 1970 onwards.

2.3 Drawing data from IMF Article IV reports

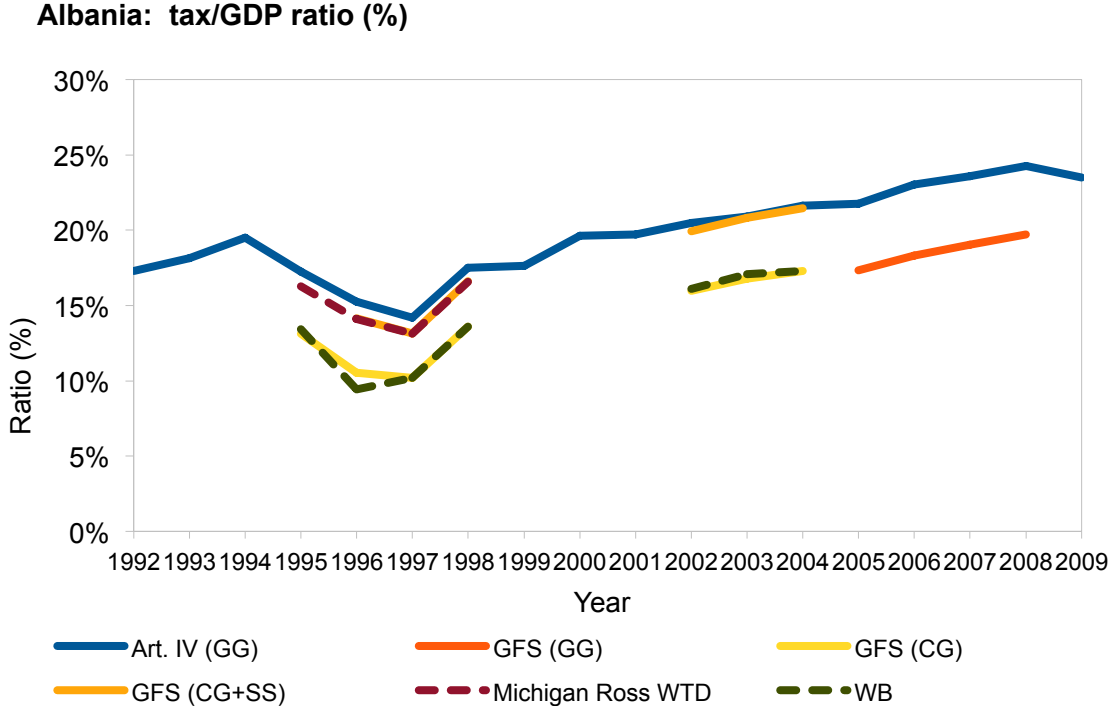
While existing international databases provide a useful starting point they are limited by still extensive missing data, particularly in those regions not covered by regional datasets, and, most acutely, their inability for the most part to deal adequately with natural resource revenue. As such, the most ambitious aspect of the project has been the systematic compilation of data extracted from IMF Article IV reports and statistical appendices. This effort builds on existing trends, as a growing number of researchers – beginning with Keen and Mansour (2009) – have turned to country-level sources in order to fill gaps in the data provided by international datasets. However, previous efforts in this direction have been region-specific and somewhat ad hoc, with researchers compiling a limited set of variables relevant to specific research projects. By contrast, we have extracted revenue data across our entire range of variables from every publicly available IMF Article IV report or statistical appendix.¹⁴

The primary benefits of Article IV data, relative to existing international sources, are twofold. First, IMF Article IV reports provide more complete data coverage, particularly for low-income countries, and thus serve to fill a number of gaps in existing international data sources. Figure 5 provides an illustration from Albania of the additional data coverage provided by Article IV data. Second, IMF Article IV reports are the only consistent source of data that

¹⁴ Note that while data from IMF Article IV reports has been compiled into a single dataset, it is not itself suitable for econometric analysis in its raw form owing to significant discontinuities over time in the way that revenue is reported for certain countries, and cases in which it is not possible to exclude resource revenue. While we have made every effort to ensure consistency over time in revenue classification, it is sometimes not possible owing to the nature of available data. Where IMF Article IV report data has been included in the final ICTD GRD, these inconsistencies have, of course, been accounted for, often through the exclusion of problematic sub-components of tax revenue. By contrast, in the free-standing dataset we have retained most available information, while simply flagging periods in which there are inconsistencies in the revenue classification.

disaggregates the resource and non-resource components of tax revenue, thus providing the basis to overcome major inconsistencies in the reporting of natural resource revenue in the GFS in particular. As a result, Article IV data becomes the primary source of data for resource-rich states, for which existing data sources are particularly inadequate.

Figure 5 Additional data coverage using Article IV data: Albania 1992-2009



Notes: Data compiled by the authors. GG denotes General Government data, CG denotes Central Government data and SS denotes social contributions.

While these advantages are substantial, it remains important to acknowledge the dangers and challenges that arise from relying on Article IV data. Most basically, Article IV data may not be as methodologically precise as GFS data from an accounting perspective, while it may also not be cleaned and verified as carefully. Insofar as these issues remain marginal they are a small price to pay for improved data coverage – again, the goal here is not perfect data, but good enough data. However, there remains a need to exercise some judgement where figures appear implausible, or are simply inconsistent with other sources.

Concerns about data quality aside, significant care has also been required in coding Article IV data into a standard classification scheme. At a broad level the data contained in Article IV reports generally follows the IMF 1986 classification scheme, but it is presented in highly varied formats which often also vary over time within individual countries. Article IV reports frequently adhere to the tax categories used nationally, requiring occasionally subjective decisions about how to group different tax types into our standard classification. It has thus been necessary to ensure that classification decisions yield aggregate revenue categories that are consistent both with other international sources, and within countries over time.¹⁵

Finally, while IMF Article IV reports offer the best available source of data on resource revenue, this does not imply perfection. Defining what constitutes resource revenue is inherently complex: beyond royalties, retained profits of state-owned enterprises (SOEs) and

¹⁵ Details about categorisation choices for each country are available in the underlying dataset in which Article IV data has been compiled.

profit sharing, should this category, for example, include only corporate taxes paid by resource firms, or also some combination of income taxes paid by employees of those firms, sales taxes paid by those firms, or customs duties? While IMF Article IV reports appear *generally* to focus on corporate taxes, this is not necessarily universal or perfectly consistent. While we do not feel that this calls any of the data significantly into question – and this data is undoubtedly better than available alternatives – it does speak to significant scope for further improvement in the raw data available from international sources.

2.4 Standardising the underlying GDP series

Having compiled data into a common format, the final step in ensuring comparability across sources and over time has been the adoption of a common GDP series. Because researchers are ultimately interested in government revenue expressed as a share of GDP, data errors and inconsistency can arise from both the revenue data itself and from national GDP figures. This is a particularly important problem when comparing data from multiple international sources, as they frequently draw on distinct GDP series, thus resulting in divergent tax-to-GDP ratios. As discussed earlier, this problem is most acute in countries that have rebased their GDP calculations, as these rebasing exercises can result in very large adjustments to nominal GDP, while these methodological changes are frequently not applied retroactively to earlier years.¹⁶ In these cases the tax-to-GDP ratio can experience very large year-to-year changes driven by changes in the underlying GDP series.

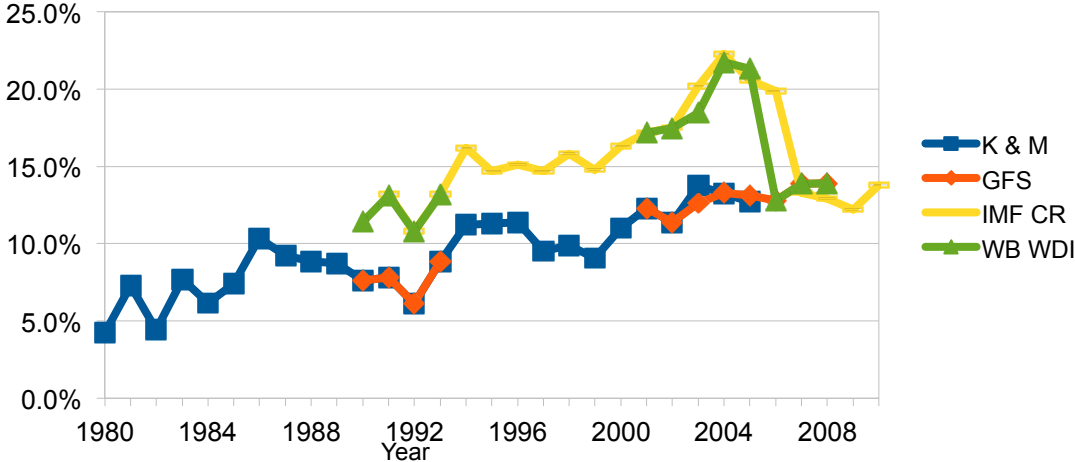
In order to eliminate these problems we have recorded all revenue data in local currency units (LCU), while employing the WEO GDP series across all data sources. The WEO GDP series is attractive because it is most systematic in updating historical data in response to GDP rebasing. However, the WEO GDP series occasionally has missing data where GDP is nonetheless available from other sources, while it does not reach back prior to 1980. We have thus employed alternative GDP series for missing years if, and only if, the alternative GDP series (most often the IMF IFS) closely matches the WEO GDP series in overlapping and nearby years.¹⁷ The increased alignment between data sources that results from a standardised GDP series is illustrated in Figure 6, which presents data for Ghana when employing source-specific GDP figures versus the common GDP series.

¹⁶ This is most notably true for the IMF *International Financial Statistics* dataset, and for individual IMF Article IV reports.

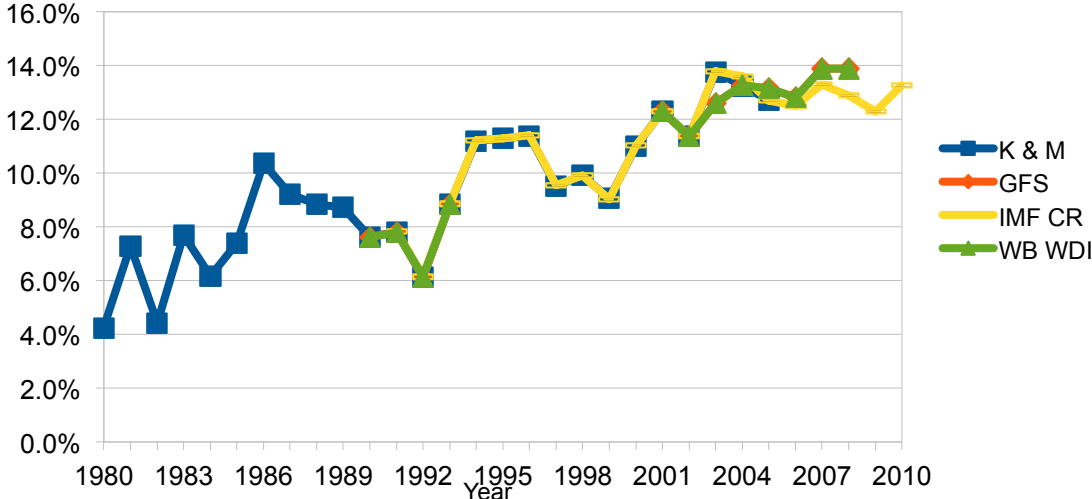
¹⁷ More specifically, when adding GDP series prior to 1980, IFS (or other) data is adopted if, and only if, the alternative series matched the WEO series +/- 5% in 1980. These parameters can, in principle, be adjusted by users should they wish to do so in order to introduce more restrictive or permissive conditions.

Figure 6 Source-specific GDP vs. common GDP series: Ghana 1990-2010

Ghana: Total tax as % source-specific GDP



Ghana: Total tax as % common GDP series



Beyond these general rules, the challenges associated with inconsistent GDP series over time have necessitated particular care in relation to IMF Article IV reports for two reasons. First, IMF Article IV reports frequently, particularly in earlier years, report revenue figures only as a percentage of GDP. In converting these figures to LCU it has been necessary to convert using the GDP figures employed within the same Article IV report, while then reconverting to tax-to-GDP ratios using the common GDP series. Second, in cases where countries have adopted new currencies over time, IMF Article IV reports contain revenue data in currency units that differ from the currency units employed by the WEO GDP series. In these cases it is necessary either to convert Article IV data to the new currency, or to employ the GDP figures contained in Article IV reports, so that the currency units match. Which solution is adopted has depended on the plausibility and fit of each solution, with the latter solution only applicable where the GDP figures contained in the IMF Article IV report in question are consistent (though in different currency units) with those in the common GDP series.

2.5 Data merging and creation of the ‘first choice’ dataset

Having established a common revenue classification, compiled systematic data from IMF country reports, and selected a common GDP series, the next stage was to merge data from multiple international sources in order to create a best possible international researchers’ dataset. To do so, the first step was the creation of a single ‘collated’ dataset, allowing for the comparison of data from all different sources for any country-year observation. This dataset, which is available upon request, has been constructed in order to create transparency about alternative data for any individual country-year, and subsequent choices about the inclusion or exclusion of particular data from the final dataset.

With the collated dataset thus created, the next stage was the actual merging of data. In order to maximise the objectivity of this process, initial data merging was based on a common formula for selecting the best possible data source for each country-year. Following experimentation the initial merging formula was based on four factors: (a) the level of disaggregation of the data (more is better); (b) the length and completeness of the time series; (c) the level of overlap and consistency when combining multiple sources for a single country; and (d) a ranking of data sources, with IMF Article IV and GFS data given priority with the exception of OECD countries, where OECD data was given priority.

Unfortunately, data merging based on a standard algorithm proved relatively problematic. In general, formula-based merging of data works well if the data sources are generally equivalent, but with different periods of data coverage. By contrast, government revenue data frequently varies significantly across sources, be it due to a different classification system, different inclusions and exclusions, problems dealing with natural resource revenue, or simple unexplained differences. As a result, automated merging of the data resulted in many instances in which there were significant breaks in the data when moving from one source to the other – either the source that was selected was inconsistent with alternative sources, or there were problems with the treatment of natural resource revenue. Even the internal dataset developed by the IMF Fiscal Affairs Department, which relies solely on IMF and OECD datasets, encounters problems of discontinuity when merging data from distinct sources.

The relative imperfection of the automated data merging exercise in turn necessitated the implementation of a systematic manual data cleaning process. This process has required that every country-year data point be manually reviewed in order to identify any inconsistencies or problems with the merged data, with problematic data replaced by superior data where necessary and appropriate. This process of manual cleaning has introduced a modestly subjective element to the selection of data for the final dataset, but is the only plausible method for overcoming the varied sources of inconsistency across data sources. In order to make the process as credible as possible, every effort has been made to ensure that the process has been systematic, and, most importantly, to document transparently the sources for each data point and the specific justification for adopting particular data whenever it is ambiguous. The edited working dataset, containing all of these explanations, is available upon request in order to allow all data choices to be scrutinised.

Broadly, the data cleaning process has included three stages, which are described in turn.

2.5.1 Inconsistencies, completeness and appropriate sources

The first stage involved a general review of the merged data to identify cases in which there were outright inconsistencies or errors, or in which there were opportunities to improve data coverage or quality. This involved several overlapping activities:

Identifying data inconsistencies. The most basic task was to review every transition between data sources in order to ensure consistency between the two sources being merged. Generally speaking, this involved ensuring that the two sources being juxtaposed had identical, or near identical, data during overlapping years, and could thus be considered comparable. Where two data sources that had been juxtaposed were not fully consistent there was a need either: (a) to employ an alternative data source that could achieve greater consistency; or (b) to remove the offending data entirely, sacrificing coverage in order to ensure accuracy.

Scanning for irregular data. In the same spirit, every data entry was scanned for any irregular data, most often in the form of unusually high or low tax values, or very rapid changes in levels of revenue collection. Where such irregularities were identified, specific checks were conducted against alternative data sources and historical developments in the relevant countries in order to assess the plausibility of the data. Where there were strong reasons to question the validity of the data, such as major contradictions between alternative data sources, it was excluded, replaced or flagged as potentially problematic.

Identifying opportunities for improved data coverage. Alongside scanning for potentially problematic data, efforts were also made to improve data coverage by calculating missing values from available sub-components. Owing to the imperfections of existing sources, as well as different classification systems, it is common, for example, to find sources that report all of the sub-component of direct (or indirect) taxes, but do not report the aggregate figure for direct (or indirect) tax. In these cases simple arithmetic operations have been carried out (and noted) in order to improve coverage.

Identifying discrepancies in the recording of indirect taxes. There are occasional discrepancies across sources in the allocation of revenue between taxes on goods and services, and taxes on international trade. Most often this results from differences across countries and sources in whether sales taxes (including Value Added Tax (VAT)) collected at the border are reported as taxes on goods and services, or taxes on international trade. This issue has been previously identified in the creation of the Keen and Mansour (2009) dataset, which uses Article IV data to construct a time series for taxes on international trade for African countries that is strictly exclusive of sales taxes collected at the border. Unfortunately, other international sources frequently do not allow for drawing this distinction consistently and confidently. As such, the objective here has been to ensure consistency within individual countries by identifying any cases in which there is a dramatic shift of revenue from one category to another, with subsequent efforts to identify data sources that are consistent over time. We return in the next section to a discussion of continuing imperfections in the data related to the sub-components of indirect taxes.

Identifying other discrepancies in revenue classification across sources. Finally, the data cleaning process has involved identifying cases where tax revenue is classified under different sub-components by different sources. Thus, for example, one source may classify certain tax revenue as other taxes, while an alternative source classifies those same taxes as taxes on goods and services. In these cases we have first attempted to identify sources that are mutually consistent over time; failing such consistency, we have removed data for the sub-components of tax revenue where data has not been compatible with surrounding years.

2.5.2 Accounting for natural resource revenue

The second stage of manual data cleaning has focused on accounting consistently for natural resource revenue. As noted earlier, countries and data sources vary in whether natural resource revenue is recorded as tax revenue, non-tax revenue or, frequently, some combination of the two. The only source that consistently accounts specifically for natural

resource revenue is IMF Article IV reports; OECD *Tax Statistics*, for both the OECD and Latin America, often also make this distinction apparent in detailed country tables. Given these objectives, IMF Article IV (or occasionally OECD) data has been employed for any country in which tax revenue data reported in the major international database includes significant resource revenue.

The goal of the data cleaning process has been to ensure that for countries with significant resource wealth, resource revenue is consistently either: (a) recorded as non-tax revenue, or (b) separated out from the non-resource component of tax revenue. The minimum objective of the data cleaning is to have a clean set of tax revenue figures that are exclusive of natural resource revenue, as this is frequently the figure that is of greatest analytical and policy interest. Meanwhile, the ideal scenario is to be able to identify separately: (a) the magnitude of non-resource revenue, including both tax and non-tax revenue; and (b) the magnitude of resource revenue, including both tax and non-tax revenue.

In practice, it has almost always been possible to achieve the good enough objective of isolating non-resource tax revenue, thus offering a relatively complete time series for this variable. By contrast, it has frequently been impossible to disaggregate non-tax revenue between its resource and non-resource components. In these cases the dataset thus tell us precisely how much non-resource tax revenue a country collects, but cannot distinguish resource revenue and other types of non-tax revenue – thus preventing an overall measure of total resource revenue. In these cases the total resource revenue and the resource component of non-tax revenue variables are left blank.

Finally, there are a relatively small number of cases in which it has been impossible to separate resource taxation from other forms of tax revenue, such that tax revenue continues to be inflated by the proceeds of resource extraction. This has generally occurred where Article IV data has been unavailable or unusually incomplete. As described in greater detail below, this data has been flagged as analytically problematic for econometric analysis because of its inconsistency with surrounding data.

2.5.3 Accounting for social contributions

While accounting consistently for natural resource revenue marks the most important single innovation in the ICTD dataset, a less widely recognised issue relates to inconsistency across sources (including between pre- and post-1990 IMF GFS data) in the treatment of social contributions. Social contributions are variously treated as a separate category, tax revenue, non-tax revenue or excluded entirely, depending on the source and country. As such, the final stage of the data cleaning process has focused on ensuring that all tax and revenue data in the ICTD GRD is reported inclusive and exclusive of social contributions, and that data is consistently classified between the two categories.

These adjustments are, for the most part, straightforward. While data sources vary in their classification of social contributions, they are generally consistent both across and within countries. However, this is not always the case, and several types of problems arise.

First, data drawn from Article IV reports can pose particular problems owing to highly varied reporting both within and across countries. Where Article IV reports are ambiguous or irregular, it has been necessary to collect and classify data in such a way as to be consistent with alternative data sources.

Second, data from the IMF GFS needs to be dealt with cautiously, as, for example, data for the consolidated public sector generally includes much higher levels of social contributions than budgetary data. In these cases it is essential that the data employed in any individual country be consistent over time, lest discontinuities be introduced in the data.

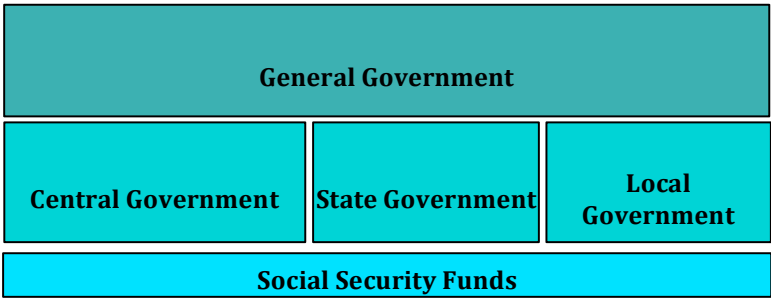
Third, for some countries certain types of payroll taxes are highly ambiguous in whether they should be treated as social contributions or income taxes, thus leading to discrepancies across sources. In many cases it is possible to resolve these discrepancies by reclassifying data from one or the other source, though in some cases it has been necessary to exclude ambiguous data in order to ensure accuracy.

Fourth, for some developing countries the quality of data reporting is limited, leading to a failure to report social contributions consistently. In these cases Article IV reports, for example, may reveal that social contributions exist, but these contributions may not be treated separately within the IMF GFS, making it impossible to distinguish social contributions from other types of government revenue effectively. Where social contributions appear to be relatively large (normally greater than 1 per cent of GDP), columns for tax and revenue exclusive of social contributions (which are most relevant for econometric analysis because of the greater completeness of the data series) are left blank. Meanwhile, social contributions have been assumed to be zero when they are comparatively negligible in magnitude.

2.6 Ensuring comparability between unitary and federal states

The final element in the production of the ICTD dataset has been an effort to account appropriately for differences between central government and general government data. In principle, the major international datasets collect data for central, state (where applicable) and local levels of government, which are then aggregated into general government revenue data, as illustrated in Figure 7. However, in practice data for sub-national levels is frequently unavailable for developing countries, with data then only being available for central government. As a result, most cross-country research dealing with developing countries has historically focused on central government data only, in order to maximise data coverage. However, while central government data provides a relatively accurate measure of government revenue in highly centralised countries, it often substantially underestimates revenue collection in more decentralised countries, with the potential to severely distort econometric results or cross-national comparisons.

Figure 7 General government and its subsectors



The most viable solution to this problem is to rely on central government data for centralised countries (for which general government data is not available), but to rely on general government data for all countries with significant sub-national revenue sources. In principle this approach risks creating a new set of distortions by ignoring sub-national revenue sources in highly centralised countries. However, in practice sub-national tax revenue generally accounts for less than 5 per cent of total tax revenue, and often a significantly smaller proportion, in highly centralised (generally low-income) countries. As such, any distortion of this type is likely to be negligible, whereas the distortions implied by relying solely on central government data are comparatively very large.

Consistent with this logic, several recent papers from the IMF have adopted this approach, but have done so imperfectly. Acosta-Ormaechea and Yoo (2012) employ general government data for comparatively decentralised OECD countries, but do so for only two decentralised developing states (Argentina and Brazil). Benedek et al. (2012) similarly employ general government data in some cases, but their approach is more ad hoc and inconsistent. By contrast, the approach here has been to systematically employ general government data whenever it is available,¹⁸ while excluding central government data where there is evidence that sub-national data is substantial but unavailable. A full list of countries and the relevant level of data employed is available on request, and also captured in the dataset itself.

3 Remaining limitations and challenges

Through the data compilation, merging and cleaning described so far, the ICTD dataset achieves substantially better data coverage than any single existing source, as detailed in Table A3. At least as important as the level of data coverage, however, is the improved accuracy of the data. As has already been noted, existing international sources have been systematically unable to deal effectively with resource revenue, while they have also at times been characterised by problematic GDP series and inconsistent data. Meanwhile, attempts to construct composite datasets have, as reflected most notably in the IMF Fiscal Affairs Dataset, been plagued by further inaccuracies resulting from discrepancies between alternative data sources. The ICTD dataset achieves major improvements in accuracy on all of these counts, by dealing systematically with natural resource revenue and through painstaking manual cleaning of merged data.

Having noted these achievements, however, there remain inescapable limitations that demand explicit acknowledgement. If there is an overriding message that emerges from the process of producing this dataset, it is that reliable econometric research demands a clear understanding of the limitations of available data. With this in mind, what follows recounts the key issues that demand attention, moving from the relatively concrete and manageable to the more general and unresolvable.

3.1 Problems flagged in the dataset

In various instances there are data inconsistencies or other problems that cannot be resolved using any available international sources. In these cases data has been flagged as potentially problematic in various ways, in the expectation that researchers will exclude this data as appropriate to their analysis. These flags within the primary dataset are as follows:

3.1.1 Unresolvable inconsistency with surrounding data

The first flag, *Prob1*, excludes data for which there are seemingly obvious problems with either revenue figures or related GDP figures, thus arguing in favour of exclusion from econometric analysis. This is generally the case where figures are dramatically out of line with surrounding years and where there are reasons to be sceptical of data quality. This may result from dramatic currency developments, either through revaluation or rapid inflation, as they can make it difficult to reconcile LCU revenue figures with available GDP figures (e.g. Brazil 1990-1994, central government), or may reflect seemingly implausible swings in revenue performance from year to year (e.g. Equatorial Guinea 1980-84). Beyond cases

¹⁸ The one exception is in cases where general government data is virtually identical to central government data but provides significantly less complete data coverage.

where data is quite obviously problematic, we also flag *twc2*, treat with caution 2, a slightly wider set of cases in which there are reasons to treat the data with some scepticism owing to sharp year-to-year variation (e.g. Kazakhstan 1990-1995), a not-quite-perfect match with other data sources (e.g. Cambodia 2006), or implausibly high values (e.g. Liberia, particularly 1980-88).

3.1.2 Insufficient data to account for resource revenue

The second flag, *Prob2*, excludes data where it is impossible to isolate resource revenue from official tax revenue figures, thus making the data analytically incomparable to other years and countries. In a few cases all data for particular countries falls into this category (e.g. Libya), but it is more common that this applies only to a subset of available country-years (e.g. Angola 1992, UAE 1990-1996). In these cases the non-resource component of the tax revenue variable is also left blank, signalling our inability to exclude resource revenue, while the flag is included in order to signal the existence of the problem.

For countries that are known to have access to modest resource revenue (believed to lie in the range of 1-2 per cent of GDP,¹⁹ and not appearing to cause any noticeable discontinuity in the data series), we view the data as likely suitable for econometric analysis, though we attach a separate flag, *twc1* (treat with caution 1). Finally, where countries are known to have relatively negligible resource revenue (believed to be less than 1 per cent of GDP) the data is not flagged at all (e.g. Ghana).

In addition to cases in which it is impossible to exclude resource revenue from total tax figures, which are flagged as *Prob2*, there are a subset of cases in which it is possible to exclude resource revenue from *total* tax revenue, but not from the *sub-components* of tax revenue. In these cases the relevant sub-components of tax revenue (direct taxes, indirect taxes, taxes on income, profits and capital gains, taxes on corporate income) include distinct categories for resource and non-resource components of tax revenue, and the non-resource variable is left blank in order to signal our inability to exclude resource revenue. However, we also include a flag, *Prob4*, in the dataset in order to signal the existence of this problem, as well as the possibility that the sub-components of indirect taxes (which do not have distinct resource and non-resource variables attached to them) may also be inclusive of some quantity of resource revenue.

3.1.3 Analytically incomparable data

The third flag, *Prob3*, is used to highlight data that is technically accurate but may be problematic for some types of research because it is not strictly analytically comparable to surrounding data. This relates most commonly to cases where there is a disproportionate role of SOEs in generating government revenue; we also apply the same flag to Namibia until 1990, when it achieved full independence.

The motivation for flagging countries with disproportionately large state-owned sectors lies first in a particularly unclear distinction between retained profits of SOEs and taxation, and consequent differences across countries in whether revenue from SOEs is recorded as tax or non-tax revenue. Alternative accounting choices can drive potentially major changes in the apparent composition of government revenue. The most striking example of this phenomenon arises in Vietnam, which in 1988 shifted towards recording revenue from SOEs as tax revenue, after previously recording the same revenue as non-tax revenue. The result

¹⁹ Following the general classification employed by IMF Article IV reports, which includes corporate and export taxes paid directly by resource firms, but generally appears to exclude other indirect taxes as well as income taxes paid by employees.

was an increase in reported tax revenue from roughly 3 per cent of GDP in 1987 to almost 14 per cent of GDP in 1988 (which subsequently fell to 10 per cent in 1989, thus further highlighting the potential volatility of reported revenue where definitions are unclear). In this case it has thus been necessary to flag the pre-1988 data as incompatible with subsequent data.

There is also a more fundamental conceptual question about how we should think analytically about taxation within a largely state-controlled economy. Tax revenue within state-controlled economies is largely an accounting measure applied to SOEs, with only partial analytical comparability to efforts to tax private firms within a market context. In these contexts governments may impose extremely high taxes on state-owned firms, but these are not directly borne by citizen owners. Instead, governments are, in effect, taxing their own retained profits. This discrepancy becomes most frequently apparent and relevant in cases in which countries have undergone rapid transitions from state-controlled economies to comparatively market-oriented economies. In these cases tax revenue, as quoted in official sources, tends to decline very rapidly and unevenly as a result of the transition.

However, this may be analytically misleading as the privatisation of state-owned firms often involves lower taxes in an accounting sense, but also involves citizen-owners directly bearing those taxes for the first time, implying a quite different political and administrative dynamic. This analytical distinction is amplified by a more pragmatic concern: during these transitional years we often observe extremely high levels of volatility from year to year in reported revenue figures, thus calling data quality into question, and at a minimum making these cases outliers in the broader dataset. As such, data up to and including such transitions is generally flagged until the point that tax and revenue figures stabilise, with this arising most commonly in post-Soviet states during the period 1990-1995.²⁰

3.2 The problem of disentangling goods and services taxes and trade taxes

As explained previously, there are occasionally differences across sources or within countries over time in whether sales taxes (including VAT) collected at the border are classified as taxes on goods and services, or taxes on international trade. As discussed in Baunsgaard and Keen (2005), the ideal scenario is to have a consistent classification across and within countries, most likely by treating sales taxes on imports as taxes on goods and services, and distinct from taxes on international trade. However, in practice available data does not make it possible to draw this distinction across all countries and years. While Baunsgaard and Keen (2005) and Keen and Mansour (2009) achieve this distinction by relying on IMF Article IV reports, those reports are not publicly available for all countries and often do not cover all revenue categories, making reliance on this strategy highly imperfect given the broader goals of this dataset.

As such, we opt for a pragmatic, though less perfect, solution: we ensure that data classification is consistent over time *within* countries in order to avoid any breaks in the data series, while accepting that in some cases the classification of revenue between taxes on goods and services, and taxes on international trade, may vary across countries.

We would welcome future efforts to establish a completely consistent categorisation over time and across countries – ideally using the ICTD dataset as a starting point – but for the

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Illustrative of the motivation for this correction to the data is the case of Poland. Officially, tax collection in Poland declined from 36% of GDP in 1988 to around 21% in 1991, indicating a dramatic reduction in the tax burden that is not matched by *any* state in the dataset outside of former Soviet states. However, Easter (2008) has written about the extent to which the imposition of *new tax burdens* during this period, largely through income tax, served to mobilise political demands for accountability. This divergence between official statistics and lived experience highlights the potentially misleading nature of data during these transitional periods.

time being these definitional inconsistencies across countries appear inescapable, though we believe them to be modest in magnitude. In broad terms, two solutions for econometric research present themselves. First, these concerns are significantly addressed by the use of within-country econometric estimators, as the classification scheme is consistent within countries but not necessarily across countries. In the context of within-country analysis, a decline in the relative share of trade taxes, as reported in the dataset, can sensibly be understood as such, even if trade taxes also includes some goods and services taxes collected at the border. Second, reliance on the aggregate indirect tax measure avoids this definitional problem, and is appropriate unless the research is specifically focused on the distinction between taxes on goods and services, and taxes on international trade.

3.3 Problems accounting for resource revenue

By drawing on Article IV data for resource-rich countries, the ICTD dataset achieves a dramatic improvement in the consistency and analytical appropriateness of the data as it relates to resource and non-resource components of tax revenue. However, it is important to emphasise that the measures adopted here do not represent a perfect solution – and, indeed, that a perfect solution is likely not possible based on existing sources.

Most simply, there continue to be a handful of countries for which IMF Article IV data does not exist,²¹ or for which it does not allow for distinguishing between the resource and non-resource components of tax revenue. In these cases the only available solution for most research projects is to exclude the data from the dataset entirely, as it is not analytically comparable to data from other countries. This, evidently, implies non-random missing data in the final dataset, though such instances are relatively rare. There is significant value in efforts by international organisations to collect higher quality and more systematic data about resource revenue, as both the IMF and OECD have begun to do.

More broadly, there remains an inescapable possibility of differences across countries in the definition of resource revenue – for example, countries and sources may vary in whether indirect taxes paid by resource firms are counted as resource revenue. This definitional uncertainty is reflected in modest differences between the data reported here and resource revenue figures reported elsewhere, including by the IMF (2012) and Haber and Menaldo (2011).²² Recognising that there is unlikely to be a perfect solution to these definitional issues surrounding historical data, we aim to minimise definitional inconsistency by relying almost exclusively on IMF Article IV data to account for resource revenue. The resulting corrections to the data appear to be broadly credible, and to produce realistic fiscal profiles for resource-rich states. Our instinct is that our approach is likely to be as or more consistent over time and across countries (and more easily verifiable by other researchers) than reliance on diverse country-level sources, but the limits of available data imply that this question may be technically unresolvable.

Finally, while IMF Article IV reports account separately for resource revenue in the significant majority of resource-rich countries, they do not consistently account for resource revenue where it is relatively modest (as is the case in many low-income countries with significant, but weakly taxed, mining sectors). As discussed earlier, our judgement is that while this issue should not be entirely ignored, it is modest enough in magnitude to be acceptable for analytical purposes – while there is, to our knowledge, no readily available solution. IMF

²¹ Or, at least, does not exist in the public domain.

²² Haber and Menaldo (2011) construct a measure of *fiscal reliance*, defined as the share of natural resource revenue in total government revenue. The ICTD GRD allows for calculating effectively the inverse of this figure, *tax reliance*, defined as the share of non-resource tax revenue in total revenue. The correlation between the two variables during the period 1990-2010, when the data is most complete, is -0.93, implying a very high degree of correspondence across the two sources.

Article IV reports generally account systematically for resource revenue once it exceeds 1-2 per cent of GDP, while in countries below this threshold the majority of resource revenue generally appears to come in the form of royalties rather than corporate income taxes, and royalties are almost always recorded as non-tax revenue. However, with rising mineral prices and improved taxation of the mining sector in at least some low-income countries, there is a particular need for careful attention to the potential for distortions to the data post-2010.²³

3.4 Inherent limitations of available data and the value of transparency

While the discussion so far has highlighted relatively specific and persistent challenges within the dataset, it is useful to conclude with a caution about the inherent imperfection of the dataset and of cross-country government revenue figures generally.

With respect to the dataset itself, this paper has described the process of manual data cleaning at length. This cleaning process has been both thorough and systematic, in order to make it as accurate and objective as possible. However, a degree of subjectivity is inevitable. As has been noted, there are frequent, persistent and difficult to explain differences in the revenue figures reported by different international sources. In distinguishing between these sources we have had no option but to make our most informed judgement about which source is most credible and accurate, based on whether it is consistent with other sources, internally consistent and highly disaggregated. These decisions have been made with great care, but are not beyond any possible dispute. Unfortunately, there is no prospect of knowing with certainty – particularly for data further in the past – what data source or observation is inarguably best. As such, our approach has been to offer transparency about the data choices that have been made, and their broad justification.

Despite this transparency there will inevitably be researchers who feel that these choices are suboptimal in particular cases. Some will argue for relying on a single data source – and, as a result, for regionally-focused studies – based on a belief that definitional differences across sources cannot allow for data merging of the type undertaken here. Our contention is that, from the perspective of researchers and policymakers, the benefits of data merging dramatically outweigh any minor distortions that may arise from differences in definitions across sources. This is a view, tellingly, that has been implicitly embraced in their recent work by researchers at the IMF Fiscal Affairs Department.

Others will be tempted to embrace the broad approach here, but argue for slightly different data choices. In principle, it is certainly possible to make a case for alternative data choices in particular instances. However, while there may be scope for marginal improvements through alternative choices, or by drawing on additional sources, we would argue that these benefits are likely to be outweighed by the tremendous costs to research of the proliferation of idiosyncratic datasets, and of thus generating non-comparable results. The documentation being presented alongside this dataset is an effort to secure some degree of consensus, even while recognising the inescapable imperfections of the dataset.

Beyond the limitations of the data selection process employed here, it is equally important to recognise the inherent limitations of underlying data from national authorities. Recent work by Jerven (2013b) has shed light on the sometimes highly imperfect processes underpinning national data collection in Africa, and similar challenges almost certainly exist elsewhere in the developing world. For this reason, there is a strong case for avoiding policy and research conclusions that are driven by very small trends in the data. If there is one positive to a recognition of the imperfections of available data ‘at the source’ it is this: it offers a further

²³ Zambia, Tanzania and Mozambique are examples of countries in which tax collection from the mining sector appears to be increasing somewhat in recent years, thus raising the importance of more effective data gathering.

argument in favour of seeking data that is broadly complete and accurate rather than fixating on marginal definitional issues, which are likely to be swamped in any case by broader imperfections in data collection.

Finally, the most glaring issue affecting the data continues to relate not to the raw revenue data, but to questionable GDP figures – and correspondingly problematic tax-to-GDP ratios. The high profile example of dramatic GDP rebasing in Ghana in 2010 – and a subsequent precipitous fall in the tax-to-GDP ratio – is emblematic of much broader trends on the continent, which risk offering a misleading picture of actual levels of tax collection across countries. The problems posed by the underestimation of GDP are most modest in relation to short-term trends. That is, patterns of year-to-year variation in tax collection tend to be relatively similar – though not identical – whether GDP has been updated or not. Problems become more acute when looking at long-term trends, as progressively greater underestimation of GDP over time can create the appearance that tax revenue is increasing substantially more quickly as a share of GDP than is in fact the case. Finally, a focus on the magnitude of tax-to-GDP ratios across countries can be extremely misleading when GDP is underestimated, implying major risks in using tax-to-GDP ratios to draw comparisons across countries unless those countries have both recently updated their GDP figures.

These different dimensions of the problem can be seen clearly in Figure 6 above, which compares tax data for Ghana with and without updated GDP figures. Year-to-year variation in tax collection follows relatively similar trends with the old and new GDP figures – though reliance on the older GDP figures underestimates the decline in tax collection in the late 1990s. By contrast, larger problems are apparent in looking at long term trends, as the older, not updated, figures suggest a much more rapid increase in tax collection than was in fact the case. Finally, the problems of cross-country comparison are stark. In 2009, before rebasing its GDP, Ghana appeared to be among the most successful tax collectors in the developing world, while in 2010, post-rebasing, Ghana's tax performance appeared relatively average. The reality likely lies somewhere between those extremes, as we know that figures for neighbouring countries in many cases continue to be overestimated owing to out-of-date GDP series.²⁴

For practitioners, the limits of available data suggest the need for appropriate caution in using tax-to-GDP ratios to compare countries, or to assert that one country is unambiguously outperforming another. At least equally problematic are efforts to deploy relatively universal revenue targets, expressed as a share of GDP, across countries. In the past, for example, observers have suggested that countries should collect a minimum of 15 per cent of GDP in tax revenue to promote sustainable development.²⁵ However, implementing such a target is fraught with risks, as whether a country makes this cut-off point may depend as much on how it calculates GDP figures as on the effectiveness of tax collection. This is not to suggest that the data cannot be useful for cross-country comparison, but simply that such exercises need to be approached with caution, and with an appreciation of the inherent imperfection of such efforts.

²⁴ For this reason, econometric models that focus on within country variation, and particularly which focus on short-term changes in tax collection, appear likely to be relatively robust to problems with GDP measurement. By contrast, models that rely primarily on cross-country variation are more likely to offer misleading results.

²⁵ Per IMF (2011: 7): 'This common but arbitrary benchmark appears to date back to Kaldor (1963)'.

4 A new picture of revenue trends over time

Having reviewed the construction of the dataset and its limitations, it is useful to conclude by reviewing key trends in tax and revenue collection over time, across regions and across income groups. This is a seemingly straightforward task, and researchers and policymakers have long cited figures purporting to capture these key revenue trends. However, in reality these figures have often been fundamentally misleading owing to the limitations of available data described so far.

In some cases misleading information about levels of, and trends in, tax collection has resulted from relying on incomplete data. In these cases average revenue trends for different regions or country groupings have actually captured trends for only a much smaller handful of countries for which data is available.²⁶ While the development of better quality regional datasets for Africa (AEO) and Latin America (CEPAL and CEPAL/OECD) has addressed this problem for those regions, it has remained impossible to paint a relatively complete picture of performance in other regions, or across the entire group of low-income or developing countries. A 2011 IMF Board paper on revenue mobilisation is thus forced to rely on group medians, rather than means, in calculating tax trends over time within income groups, owing in part to missing data.

More common problems have arisen from inconsistency in the recording of revenue from natural resource sectors, and particularly petroleum production. Because tax collection as recorded by existing international databases often includes significant taxation of natural resource wealth, the world's largest oil producers frequently appear to be the most successful tax collectors. While this classification may be accurate from an accounting perspective it obscures the actual point of interest, which most often is to understand the burden of taxation on society and the extent to which the government is able to extract revenue effectively from citizens. Making matters worse is that the classification of natural resource revenue between the tax and non-tax categories varies across countries, creating further inconsistency in any resultant figures or analysis.²⁷

An interesting example is the *2010 African Economic Outlook*, which explores trends in tax collection across Africa. To its credit, it at times reports tax trends both inclusive and exclusive of resource revenue. However, most tax figures in the report are reported inclusive of resource revenue, such that, for example, the first table in the report lists the following countries as the top tax collectors in the region: Libya (oil), Equatorial Guinea (oil), Seychelles (oil), Gabon (oil), Algeria (oil), Angola (oil) and Botswana (diamonds). A 2011 IMF Board paper reporting trends in tax collection among developing countries is similarly unable to account systematically for the role of resource revenue in shaping the tax trends over time that it reports, other than by removing resource-rich countries entirely from the sample in a few instances (IMF 2011). Simply, a lack of consistent attention to the distinction between resource and non-resource taxation can lead to misleading messages – and this distinction is not made consistently in most publicly available sources.²⁸

²⁶ Thus, for example, in a widely cited paper by Bird and Zolt (2005) on the role of income taxes in developing countries, data limitations entail that the share of income taxes in Africa is actually calculated as the average share of income taxes in only nine countries, many of which are disproportionately successful income tax collectors by regional standards: Burundi, Cote d'Ivoire, Lesotho, Madagascar, Mauritius, Morocco, South Africa, Tunisia and Zimbabwe.

²⁷ Conventionally, the result is that countries that are home to significant oil production by private firms appear among the world's top tax collectors, while similarly resource-rich countries that rely on national petroleum companies appear among the worst tax collectors, as almost all revenue is classified as non-tax revenue.

²⁸ This statement applies equally to the dataset compiled for the AEO, as the disaggregation of resource and non-resource taxation in the 2010 AEO is achieved using the dataset developed by Keen and Mansour (2009), discussed above.

Finally, misleading tax collection trends over time can arise from employing data that does not update historical GDP figures to reflect country-specific GDP rebasing. Thus, for example, the internal dataset employed by IMF Fiscal Affairs Department researchers merges data from several alternative sources, while employing distinct, source-specific, GDP series. This minimally results in minor inconsistency across sources based on GDP series. However, greater problems arise from the fact that data from the IMF GFS is paired with GDP data from the IMF IFS, which is not retrospectively updated to reflect GDP rebasing exercises. The result is that, for example, reported tax collection in Ghana declines from 20.6 per cent of GDP in 2005 to 12.8 per cent in 2006 as a result of a break in the underlying GDP series. More broadly reflective of the lack of attention to the importance of underlying GDP series is that the 2010 AEO report noted above does not report which GDP figures are employed in calculating tax shares of GDP.

The ICTD GRD allows us to present what we believe to be the most accurate data available on levels and trends in non-resource tax collection across countries over time. We employ the region and income group categorisations employed by the World Bank, while we divide high-income countries into OECD and non-OECD groups. Because of the risk that trends may be driven by missing data and consequent changes in the composition of the sample over time, we exclude from the analysis countries for which data is available for less than fifteen of the twenty years in the sample from 1990-2009.²⁹ We generally also exclude data for 2010, which has a larger number of missing observations, particularly for resource producers. We focus primarily on more aggregated tax categories (total taxes, direct taxes, indirect taxes) in order to minimise the impact of missing data or of differences in revenue classification across sources. For the sake of transparency, the notes to the country and income group tables include a full list of the countries included and excluded.

Against this background, the Figures reported in Appendix 3 highlight several key messages, though readers should bear in mind the continuing risk that tax ratios may be overestimated in low-income countries, in particular owing to the underestimation of GDP.

4.1 Consistent increases in tax collection over time

First, and perhaps most strikingly, overall tax collection exhibited a strongly upward trend in the developing world over the two decades ending in 2009/2010, and this pattern was relatively consistent across income groups and regions (Figures A3.1-A3.6). Among developing countries as a group,³⁰ non-resource tax collection increased from an average of about 13 per cent of GDP in 1990 to about 16 per cent in 2009 (Figure A3.6). This pattern is broadly consistent with patterns reported for non-resource producing states in the 2011 IMF Board paper (IMF 2011: 14), though the pattern here is both more consistent and more pronounced.³¹

The apparent implication of this evidence is that investments in tax reform across the developing world over the past two decades have, in fact, yielded higher revenue. As discussed above, a set of important research questions can now be explored with the ICTD dataset, including whether such revenue gains have in turn been associated with higher

²⁹ Note that for the vast majority of countries we have complete time series, or are missing at most two observations over twenty years, while the trends overall do not prove sensitive to the exclusion restrictions. For countries in Eastern and Central Europe, data from the early 1990s is very volatile and much more incomplete, so we begin the analysis in 1997, including countries for which we have at least ten observations from 1997 through 2010.

³⁰ We include in this category low-income, lower middle-income and upper middle-income countries.

³¹ This may simply be the result of more consistent and complete data, and of the inclusion of resource-rich states. An alternative possibility is that it may also reflect the use of a consistent and updated GDP series over time, as this eliminates occasionally artificial declines in tax collection in IMF data driven by GDP rebasing.

economic growth, reduced inequality, improvements in governance or broader human development progress.

The new data suggests that progress in revenue mobilisation has been most rapid among low-income countries, and most notably in Africa (Figures A3.1 and A3.2). While tax collection has increased among all groups of developing countries, the rate of increase has been highest among low-income countries, where non-resource tax collection has increased about 30 per cent, from less than 10 per cent of GDP to almost 13 per cent of GDP (Figure A3.3). This increase is mirrored by trends in Sub-Saharan Africa, where average non-resource tax collection has increased from less than 12 per cent of GDP to more than 15 per cent (Figure A3.9). This same trend for Sub-Saharan Africa is sustained, though at lower levels, if we exclude small islands and the wealthier countries of the Southern African Development Community.³² Of course, this trend may be somewhat overstated relative to the underlying reality, owing to progressively larger underestimation of GDP over time in some countries.

Outside of Sub-Saharan Africa, two other regional trends stand out: the rapid growth of tax collection in Latin America, and the relative stagnation of tax collection in South Asia. Historically, Latin America has been known for unexpectedly low levels of tax collection, which has in turn contributed to the region having some of the world's highest levels of inequality. However, a range of commentators have argued that this trend has begun to shift (Bird and Zolt 2013), and the data here provides a stark indicator of this change, with average tax collection increasingly steadily from less than 13 per cent of GDP in 1990 to almost 18 per cent of GDP in 2009 (Figure A3.13). Further analysis of the relationship with inequality will likely be valuable (see, e.g., Lustig et al. 2014).

By sharp contrast, tax collection in South Asia has performed noticeably less well than in other developing regions. It has been far and away the worst performing region globally in terms of aggregate levels of tax collection, while it also experienced the most limited increase in collection over the two decades covered here (Figure A3.10). As has been noted repeatedly, unreliable GDP figures imply that caution should be exercised in comparing reported levels of collection across countries. Lower collection in South Asia could, conceivably, reflect better GDP measurement rather than lower collection. However, the lack of progress over time is readily apparent, while available research is consistent with the view that tax collection has simply been much less successful in the region than elsewhere (Hassan and Prichard 2013).

4.2 Non-resource tax collection still very limited in many countries

While tax collection has been increasing over time, once we strip away taxes on natural resource wealth average levels of tax collection are dramatically lower than earlier estimates. This changed picture is particularly stark among the group of upper middle-income countries: while a focus on total tax collection, including resource revenue, has revealed an average of almost 25 per cent of GDP in recent accounts, approaching OECD levels, non-resource tax collection is in fact only about 18 per cent of GDP (Figure A3.4).

It has long been commonplace, though somewhat arbitrary, to argue that developing countries should collect a minimum of 15 per cent of GDP in tax revenue (IMF 2011: 7). Putting aside inherent problems with relying on such an arbitrary figure (and one that is dependent on accurate GDP figures), recent studies have suggested that only a relatively small number of countries fall below this threshold. However, stripping away resource revenue reveals a much larger group of countries that fail to meet this threshold. The

³² This table is not reported here.

average level of non-resource tax collection among developing countries is less than 16 per cent of GDP, and less than 13 per cent for low-income countries (Figures A3.6 and A3.3). In 2008, fully sixty-five countries in our dataset collected less than 15 per cent of GDP in non-resource tax revenue. While this may be a rational policy choice in countries with extremely large resource endowments, among those that are not major resource producers³³ we still find forty-two countries with tax collection below 15 per cent of GDP.

This likely understates the reality, as it fails to account for the continued inflation of tax ratios resulting from the underestimation of GDP. Ghana, for example, went from being above 15 per cent of GDP in 2009 to below 15 per cent of GDP in 2010 after rebasing its GDP. Though not yet reflected in the data here, a 2014 rebasing exercise in Nigeria has led to a 90 per cent increase in GDP – and thus revealed it as one of the most ineffective tax collectors in the world. A similar 25 per cent increase in GDP through a rebasing exercise in Zambia in 2014 may see it fall below the 15 per cent of GDP target for tax collection as well. The likelihood of similarly underestimated GDP figures in other countries merely re-emphasises the still weak state of tax collection across the developing world, despite recent progress. Again, further research is needed to establish whether failure to reach the 15 per cent level, or any other, is likely to be associated with weaker development outcomes. Nevertheless, the revealed extent of lower collection performance is striking – and confirms once more the value of stronger data.

4.3 Gains in both direct and indirect taxes, led by taxes on goods and services

While a popular narrative has emerged in which (broadly progressive) direct taxes have been replaced by (broadly regressive) indirect taxes, the data tells a more complex story. On one hand, it appears to be true that taxes on goods and services have increased markedly more rapidly than any other tax category. On the other hand, direct taxes also appear to have increased substantially over time, and at a rate comparable to the expansion of indirect taxes as a whole (Figure A3.6).

Among developing countries as a group, non-resource direct taxes have increased from less than 4 per cent of GDP to almost 6 per cent of GDP, though gains have been slightly more modest among low-income countries. It is somewhat more difficult to distinguish confidently the respective roles of corporate and individual income taxes in this trend, owing to more extensive missing data. Figure A3.7 provides indicative data based on the subset of countries with relatively complete data, and suggests that increases in direct taxes have been driven in about equal measure by increases in taxes on individuals and corporations. That direct taxes in aggregate have increased at roughly the same rate as indirect taxes is encouraging in light of mounting concern globally about inequality, and a widespread understanding that poor enforcement of personal income taxes has been an endemic challenge in developing countries.

Progress in collecting direct taxes should not, however, obscure the dominant role of expanded VAT and sales tax collection in driving overall tax trends. While indirect taxes collectively have increased at a rate similar to direct taxes, this masks rapid increases in taxes on goods and services, which have been partially offset by declining trade taxes. Figure A3.8 presents trends in data for aggregate indirect taxes, as well as goods and services and trade taxes separately, while employing data only for countries with at least sixteen observations on each of the three variables. Within the sample of countries with relatively complete data the pattern is stark: starting from roughly equivalent levels in 1990, trade taxes have declined by more than 25 per cent, while taxes on goods and services have

³³ Defined as countries that receive less than 10% of GDP from natural resources and other forms of non-tax revenue.

increased by over 80 per cent – far more rapidly than any other revenue category. Further research on the impact of compositional changes in tax revenue is much needed.

4.4 Tax revenue more resilient than non-tax revenue during the financial crisis

Finally, the data suggests that across the developing world non-resource tax collection was much more resilient to the impact of the 2008 financial crisis than non-tax revenue. Across all developing country income groups and most regions, total tax collection was constant or slightly increasing in 2009, whereas non-tax revenue, of which resource wealth is the primary component, declined everywhere in the same year – sometimes dramatically (Figures A3.3-A3.6). The decline in non-tax revenue is not surprising, as the global economic crisis led to falling resource prices and fiscal stress in many resource-producing states. Somewhat more surprising is the resilience of tax revenue after the crisis, reinforcing one of the key benefits of tax reliance: increased predictability of government revenue. A more speculative pattern suggested by the data is that these benefits may be particularly significant for low-income countries. Among middle-income countries (and non-OECD high-income countries) tax revenue was at best stagnant, perhaps reflecting their comparatively close integration into the global economy. By contrast, it is in low-income countries that tax collection appears to have been most resilient after the crisis.

5 Conclusions and next steps

The benefits of the new ICTD *Government Revenue Dataset* are, we think, substantial: irrespective of minor imperfections, the ICTD GRD provides both researchers and policymakers with a dataset that is dramatically more complete and more accurate than existing options. This, in turn, stands to provide a much more reliable foundation for research, while, as demonstrated here, providing a much clearer picture of historical patterns of tax collection.

These issues should not be seen as purely technical, but have significant real world importance. In response to data problems, researchers within and outside key international organisations have either relied on data that is recognised to be problematic, or have constructed ad hoc alternatives that have not been fully open to public scrutiny – and which have been shown to include meaningful errors. These data problems have imposed significant limitations on our understanding of a wide variety of questions about taxation, non-tax revenue and development, including an inability to answer even basic questions about key tax trends over time with confidence. More troubling is evidence that, in at least some cases, poor quality data has resulted in inaccurate research findings with significant policy implications (Clist 2014; Morrissey et al. 2014).

While the ICTD dataset thus provides the basis for higher quality and replicable research findings, an equally important message is that it ultimately can only be as accurate and complete as the data on which it is built, now and in the future. The problems inherent in combining data from multiple sources – quite aside from the enormous effort required – are readily apparent, while the sustainability of any such process is an enduring challenge. Meanwhile, even our best efforts cannot overcome still significant gaps where there are not *any* publicly available sources providing adequate data. While some researchers have admirably sought to return to country-level statistical sources to fill such gaps, this process, when not undertaken systematically by international organisations, opens additional questions about the comparability of data over time and across space.

Given these limitations, the ICTD GRD is best understood as an intermediate measure for improving the quality of government revenue data. In the presence of major challenges with existing data, it offers a dramatically improved foundation for immediate research and policy advice. However, over the long term the task of constructing a complete, reliable and sustainable cross-country government revenue dataset, suitable for high-quality research, is best undertaken by international organisations themselves. It is only these international organisations that have the reach and resources needed to put in place a standard system of classification across countries, to gather data consistently, and to ensure that these efforts are sustained. Optimistically, important initiatives are underway. However, the limitations of individual international sources remain pronounced, and overcoming them will require both greater resources and greater inter- and intra-organisational cooperation than appears to have been the case to date.

Several further lessons emerge from the process of constructing the ICTD GRD. First, is the increasingly noted importance of consistent (and accurate) GDP data, to ensure comparability of tax data across countries. Second, is the critical importance of adopting a consistent approach to natural resource revenue, from both oil and mining, particularly as these revenue sources expand in many low-income countries. Third, is to address the recent reduction in data availability through IMF Article IV reports, which threatens the approach taken in the ICTD dataset and the broader availability of data in the future.

Finally, attention is needed to the balance between data quality and coverage. Taken too far, concerns over data quality can sharply reduce the availability of data from states where statistics departments are particularly weak, or data disclosure particularly limited. On the other hand, too little attention to data quality stands to undermine the credibility of any international dataset. If necessary, one option may be to include information on data quality within international datasets, allowing researchers and policymakers to include or exclude less credible data depending on their needs, in a manner similar to the flags included in the ICTD GRD.

We look forward to closer attention being paid to tax data – including, of course, through criticism of our work. Our hope is that the ICTD GRD described in this paper will come to be accepted as the best available source of historical government revenue data, that it will contribute to – and perhaps accelerate – discussions about the collection and dissemination of more complete and accurate data, and that more robust research findings and better-supported policy decisions are the eventual result.

Appendices

Appendix 1 Data coverage

Table A1 Data coverage ICTD GRD by revenue type 1990-2010

	Total revenue	Total taxes	Direct taxes	Taxes on income	Taxes on individual income	Taxes on corporate income	Indirect taxes	Taxes on goods and services	Taxes on trade	Non-tax revenue
Low-Income	578	576	506	475	347	352	504	496	513	570
Lower middle-income	856	856	700	655	540	518	700	664	667	838
Upper middle-income	883	916	842	770	601	559	829	792	792	859
High-Income (non-OECD)	456	428	408	351	222	269	399	357	366	428
High-income (OECD)	542	587	586	568	568	568	586	586	561	542
Total	3465	3513	3186	2956	2392	2364	3162	3035	3043	3384

Table A2 Data coverage ICTD GRD by revenue type 1980-2010

	Total revenue	Total taxes	Direct taxes	Taxes on income	Taxes on individual income	Taxes on corporate income	Indirect taxes	Taxes on goods and services	Taxes on trade	Non-tax revenue
Low-income	804	796	646	608	422	426	640	622	651	774
Lower middle-income	1150	1107	811	763	608	581	818	765	791	1070
Upper middle-income	1163	1152	1007	916	711	655	985	961	964	1070
High-income (Non-OECD)	583	525	492	426	259	319	483	442	461	525
High-income (OECD)	666	842	841	822	811	806	841	841	816	666
Total	4595	4649	3996	3728	2970	2924	3966	3826	3882	4329

Table A3 Data availability by source and country income group 1990-2010³⁴

		ICTD	IMF Fiscal Affairs	Article IV (Central Gov't) ³⁵	GFS (Central Gov't) ³⁶	WDI (Central Gov't)
Low-income	Total revenue	578	411	388	366	303
	Total tax	576	513	552	367	303
	Tax on income, profit and capital gains	475	513	409	367	303
	Tax on goods and services	496	510	382	367	303
Lower middle-income	Total revenue	856	709	463	591	445
	Total tax	856	693	638	598	445
	Tax on income, profit and capital gains	655	650	400	598	445
	Tax on goods and services	664	625	315	598	445
Upper middle-income	Total revenue	883	793	633	434	312
	Total tax	916	770	705	431	312
	Tax on income, profit and capital gains	770	746	532	430	312
	Tax on goods and services	792	721	395	430	312
All developing countries	Total revenue	2317	1913	1484	1391	1060
	Total tax	2348	1976	1895	1396	1060
	Tax on income, profit and capital gains	1900	1909	1341	1395	1060
	Tax on goods and services	1952	1856	1092	1395	1060
High-income OECD	Total revenue	542	607	282	452	333
	Total tax	587	605	214	461	333
	Tax on income, profit and capital gains	568	605	205	460	333
	Tax on goods and services	586	603	150	460	333
High-income non-OECD	Total revenue	456	351	376	227	188
	Total tax	428	353	256	234	188
	Tax on income, profit and capital gains	351	322	150	234	188
	Tax on goods and services	357	309	56	234	188
All countries	Total revenue	3465	3022	2250	2070	1581
	Total tax	3513	3071	2506	2091	1581
	Tax on income, profit and capital gains	2956	3040	1801	2089	1581
	Tax on goods and services	3035	3025	1397	2089	1581

³⁴ Data from international sources was extracted in late 2011 and, as a result, there remain significant gaps in data for 2010 in the figures reported here. Updating of the data will be undertaken in due course, but short-term priority has been given to finalising and sharing the data publicly.

³⁵ Whether or not IMF Article IV reports are deemed to include taxes on income, profits and capital gains, or taxes on goods and services, depends to some extent on subjective judgements about the possibility of aggregating reported sub-components of tax revenue, which vary across countries and over time. As such, these figures should be treated as approximate.

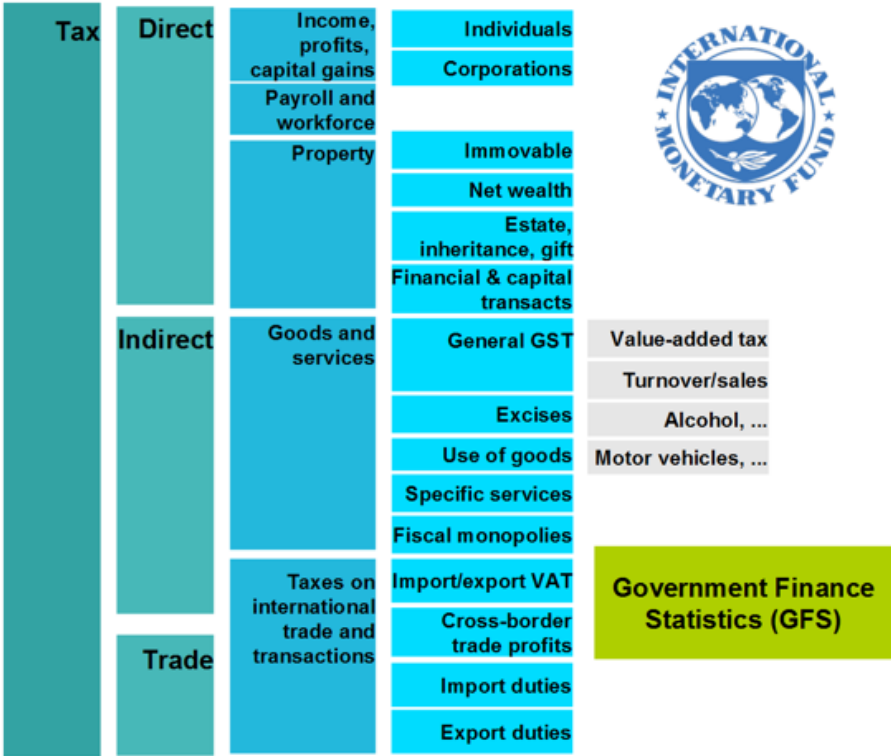
³⁶ The data contained in the IMF GFS dataset undergoes marginal changes periodically, apparently reflecting delayed government reporting and judgements about what data can and cannot be included. As such the figures reported here are approximate, based on our download of the data in late 2011, and may not precisely match later downloads.

Appendix 2 Details of underlying data sources

A2.1 IMF Government Finance Statistics (GFS)

The IMF GFS is widely viewed as the most authoritative source of cross-country government revenue data. It is compiled by the organisation with primary responsibility for engaging countries around fiscal policy, which gives the IMF consistent access to the relevant data from national sources. Moreover, the GFS has, in theory at least, the most disaggregated data possible. Definitions of tax variables (such as taxes on income, profits and capital gains, or excises) can be found in the *IMF Government Finance Statistics Manual 2001*, while the key tax categories are depicted in Figure A2.1.

Figure A2.1 Structure of tax classification for the IMF GFS 2001



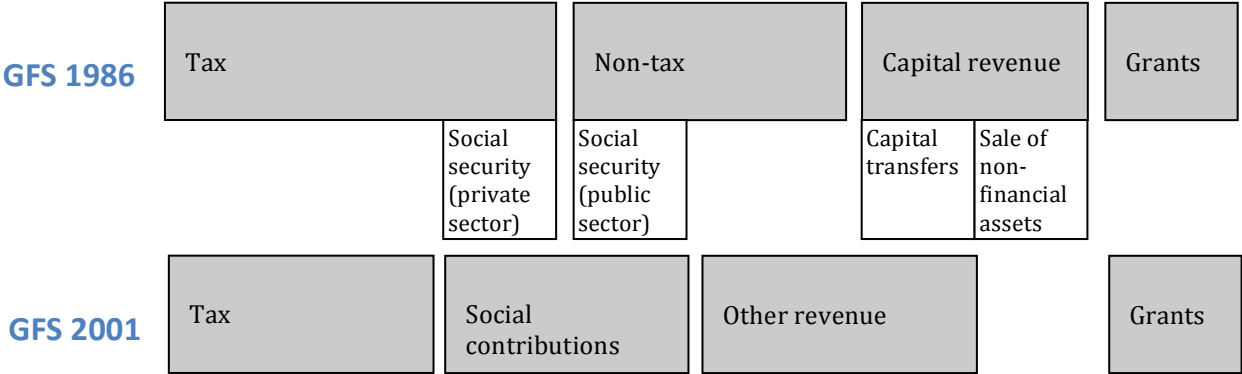
However, in practice, the IMF GFS still suffers from extensive missing data – even where such data can be found in IMF country-level sources, while many researchers, even within the IMF, have turned to the construction of ad hoc datasets from country-level sources. Critically, from the perspective of research, the IMF GFS does not make any consistent distinction between natural resource revenue and other sources of tax and non-tax revenue, with variation across countries in whether resource revenue is recorded as tax or non-tax revenue.

Additional complexity arises from the adoption of a new classification system in 2001 (applied retroactively to data from 1990 onwards) to replace the 1986 classification system.³⁷ In the revised GFS system flows are recorded on an accrual basis, whereas GFS 1986 transactions are recorded on a cash basis. However, in practice the transition to accrual accounting only appears to have taken effect for about sixty out of the 153 countries for

³⁷ Here we highlight some of the most important changes. Refer to Section 1.D and Appendix 1 of the *IMF Government Finance Statistics Manual 2001* for a fuller account.

which revenue data is reported. The new classification system also shifts several revenue categories, as depicted in Figure A2.2. In GFS 2001 sales of non-financial assets are no longer classified as government revenue (as they do not affect net worth). Social contributions include both those from the private and public sectors, which were previously separated into tax and non-tax categories, respectively, with this change necessitating general attention to potential differences in classification across countries, as well as specific attention to potential discrepancies in classification between data before and after 1990.

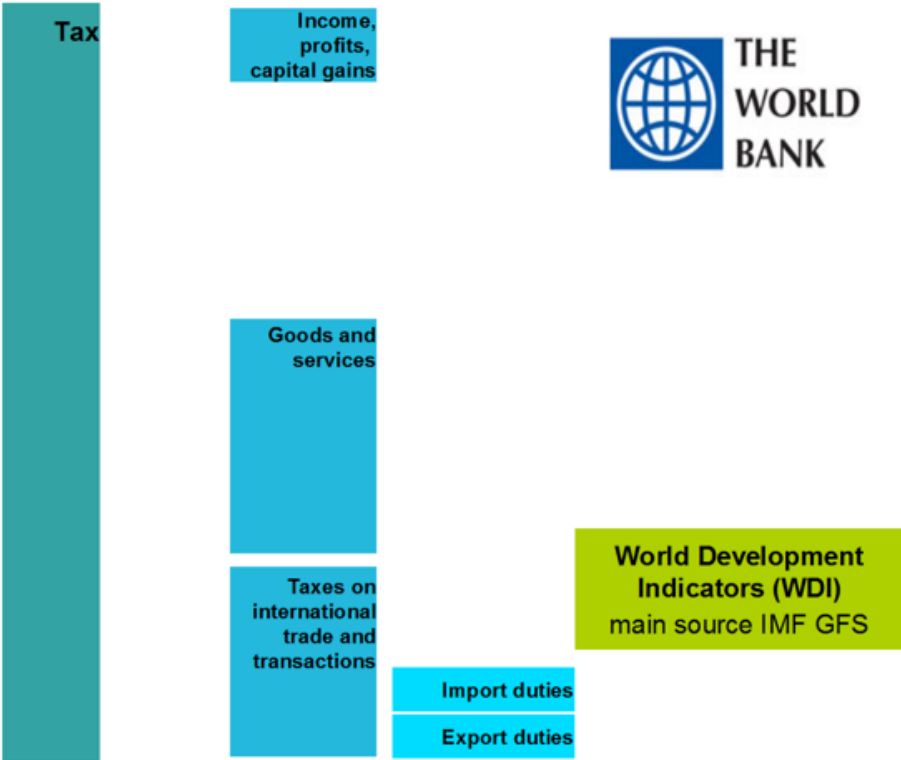
Figure A2.2 Relationship between old and new IMF classifications



A2.2 World Bank *World Development Indicators* (WDI)

The World Bank uses GFS data to produce more limited data series through its *World Development Indicators* – these categories are depicted in Figure A2.3. Despite the WDI generally deriving from the GFS, there are instances, particularly for lower-income countries, in which the WDI reports data that is not contained in the GFS data series, the provenance of which is not entirely clear and the accuracy of which has at times been problematic.³⁸ There are also occasional, and generally minor, differences in the specific data reported, while there are likewise cases in which the WDI does not contain data that is contained in the GFS, again for reasons that are not entirely clear. As such, some researchers have previously used WDI data to improve upon the data coverage offered by the IMF GFS alone.

Figure A2.3 Structure of tax classification for the WDI

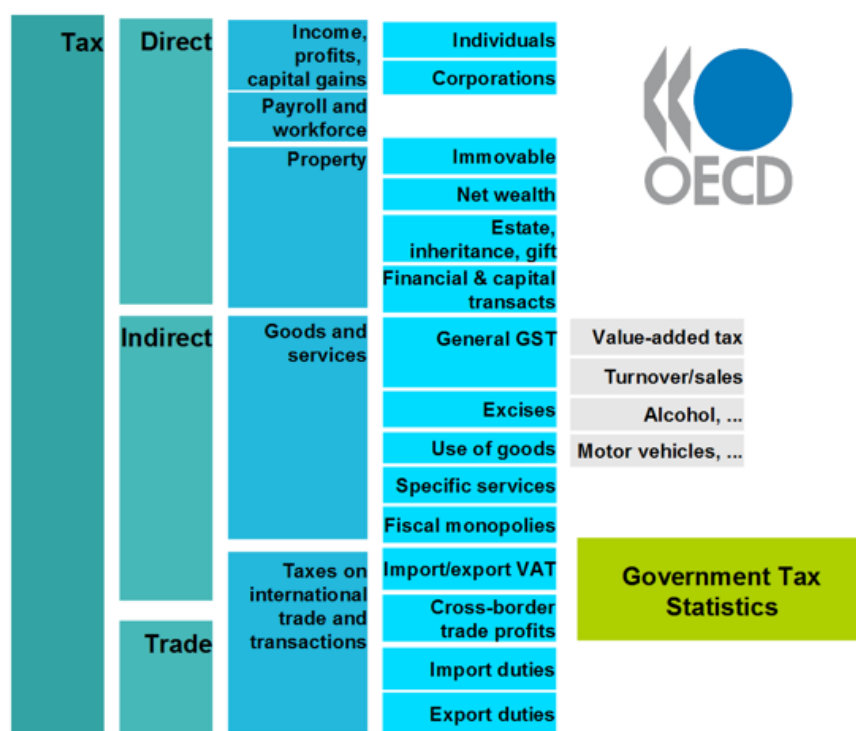


³⁸ Notably, different versions of the WDI over time have included slightly different data coverage. This has presumably reflected changing views about the quality of particular data, but also further highlights the overall challenges associated with these data series.

A2.3 OECD Revenue Statistics

The OECD collates detailed data from member countries, with strong coverage consistent with the relative wealth of the members, making it the most complete and detailed source of data for OECD countries. The OECD classification of taxes is similar to that of the IMF, though important differences in classification result in slight differences in data reported by the two sources. These differences are described in detail in *The OECD Classification of Taxes and Interpretative Guide 2004*. In *OECD Revenue Statistics* compulsory social security contributions are treated as taxes, thus attention is needed to this classification difference when combining with data based on the IMF classification. The OECD classification also combines taxes on goods and services, and taxes on international trade and transactions, into a single category, from which taxes on international trade and transactions can be extracted approximately. Finally, the *OECD Revenue Statistics* dataset focuses exclusively on tax revenue, and thus does not include total government revenue, which can instead be found in OECD national accounts data - though this may introduce minor definitional differences.³⁹

Figure A2.4 Structure of OECD tax classification

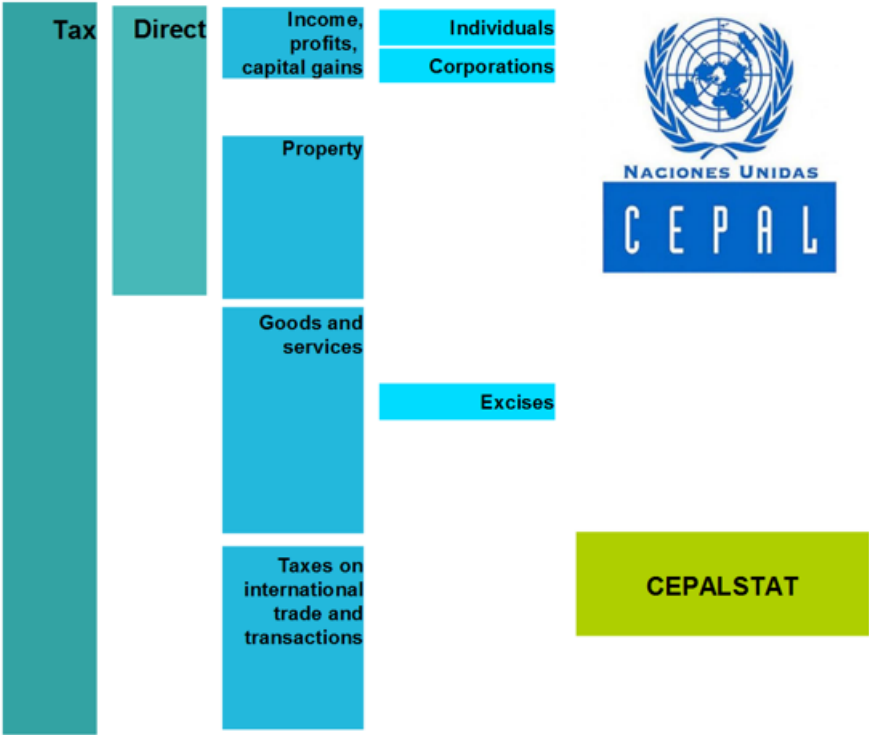


³⁹ Note that tax data in the national accounts tables is often significantly different from that contained in the OECD *Revenue Statistics*, but the latter are more consistent with the needs of this exercise. Furthermore, it is important to note that there can be small differences in data between the OECD Comparative Tables and their Details of Tax Revenue tables, with the former being preferable at the level of aggregation used for cross-country comparison.

A2.4 CEPALSTAT (Estadísticas de América Latina y el Caribe)

The *CEPALSTAT* dataset is compiled by CEPAL directly from national sources. It adheres to the major revenue categories defined by the GFS, but within those categories follows a somewhat distinctive classification system, which can lead to significant, though generally consistent, differences between CEPAL data and that from the IMF GFS. The primary strength of the CEPAL dataset lies in achieving the highest degree of data coverage for Latin America and the Caribbean, though its compatibility with other international datasets needs to be treated with care. Finally, like the *OECD Revenue Statistics*, the *CEPALSTAT* Tax Revenue dataset does not include data on non-tax revenue and total government revenue, which are located in the Government Operations dataset. As with the OECD data, this can result in minor data discrepancies, and large discrepancies in a small number of cases, and must therefore be approached with caution.

Figure A2.5 Structure of tax classification for CEPALSTAT



A2.5 OECD/CEPAL/CIAT Revenue Statistics in Latin America database

Since 2012 the OECD, CEPAL and CIAT have collaborated on the production of the *Revenue Statistics in Latin America* database. In broad terms, the initiative draws on data from CEPAL and its member countries in order to construct a new dataset that follows the OECD revenue classification system, with the goal of increasing international comparability. The *Revenue Statistics in Latin America* database generally conforms closely to the data contained in the CEPAL dataset. However, differences of classification occasionally result in sizeable differences across the two data sources, thus necessitating care in comparing or merging CEPAL data with data from the *Revenue Statistics in Latin America* database.⁴⁰ As with the *OECD Revenue Statistics*, the *Revenue Statistics in Latin America* database does

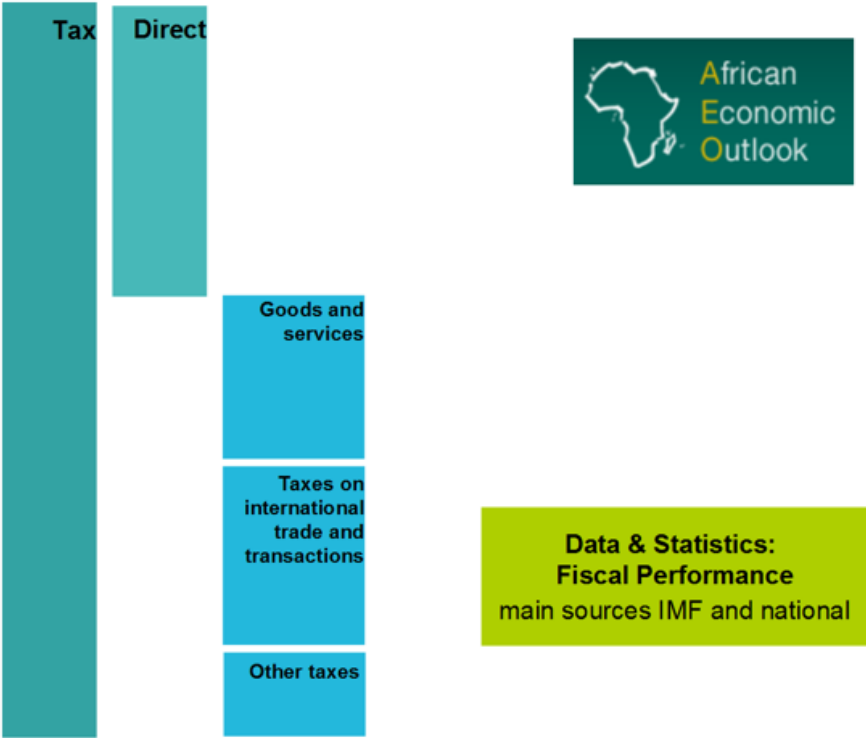
⁴⁰ One example that is illustrative of the somewhat unpredictable nature of these classification differences relates to the recording of hydrocarbon revenue in Mexico, which is treated as tax revenue in the *Revenue Statistics in Latin America* database, but as non-tax revenue by *CEPALSTAT*.

not contain data for total government revenue, which can instead be taken from the *CEPALSTAT* database. Again, significant care is required in doing so, owing to the potential for discrepancies between the two sources. Finally, as with the OECD dataset, taxes on goods and services, and taxes on international trade, are aggregated into a single category, which can be approximately disaggregated into its component parts in order to match the IMF classification. Ultimately, owing to its greater comparability with other international sources the *Revenue Statistics in Latin America* dataset has generally been given preference over the CEPAL dataset in the construction of the ICTD dataset.

A2.6 OECD/AfDB African Economic Outlook African Fiscal Performance

Somewhat similar to the *Revenue Statistics in Latin America* database, the African Economic Outlook *African Fiscal Performance* has involved collaboration between the OECD and the African Development Bank to develop a more complete regional source of tax data. The dataset achieves a high level of data coverage, but the range of variables is limited (Figure A2.6), while the time period is limited to 1996-2010. In addition, updating of the data has been somewhat sporadic, documentation of sources incomplete and interfaces for using the data limited, all of which impose modest additional limitations on the use of the data. Notably, the most recent iteration of the dataset includes estimates by country of the level of resource rents, though this data is difficult to use owing to a lack of clarity about the underlying sources and methods for estimating the level of rents, and poor integration between the resource revenue figures and the separate reporting of aggregate tax and revenue categories.

Figure A2.6 Structure of tax classification for the AEO African Fiscal Performance



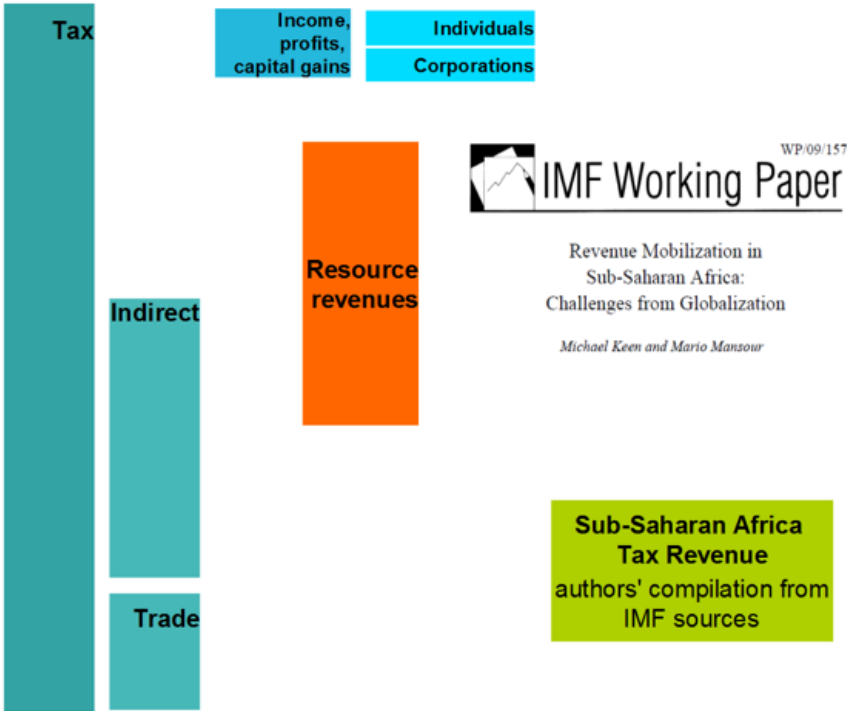
A2.7 Existing research datasets

Alongside these international databases we have also consulted three well-known datasets developed by researchers.

A2.7.1 Keen and Mansour (IMF)

The most widely cited researcher dataset is that developed by Mick Keen and Mario Mansour (2009) from the IMF. That dataset has recently been updated (Mansour 2014), though the updated data is not included in the ICTD GRD. The dataset draws data from IMF Article IV reports and other country-level sources, only some of which were publicly available at the time. The focus of the dataset was twofold: to record tax revenue from natural resources more accurately, and to construct a data series for taxes on international trade that was consistently exclusive of sales taxes on imports. As a result, the dataset contains the most systematic effort to capture resource revenue, as well as a uniquely consistent trade tax data series, while the data is generally complete and accurate for the countries covered. However, the coverage of the dataset is limited to Africa, the range of variables included in the dataset is partial, and the construction of the variables is idiosyncratic to the particular goals of the study, making them sometimes difficult to compare to other sources and studies. As discussed below, the approach adopted by Keen and Mansour thus provides inspiration for the approach adopted here, but it proves generally difficult to combine data from Keen and Mansour directly with data from other sources.

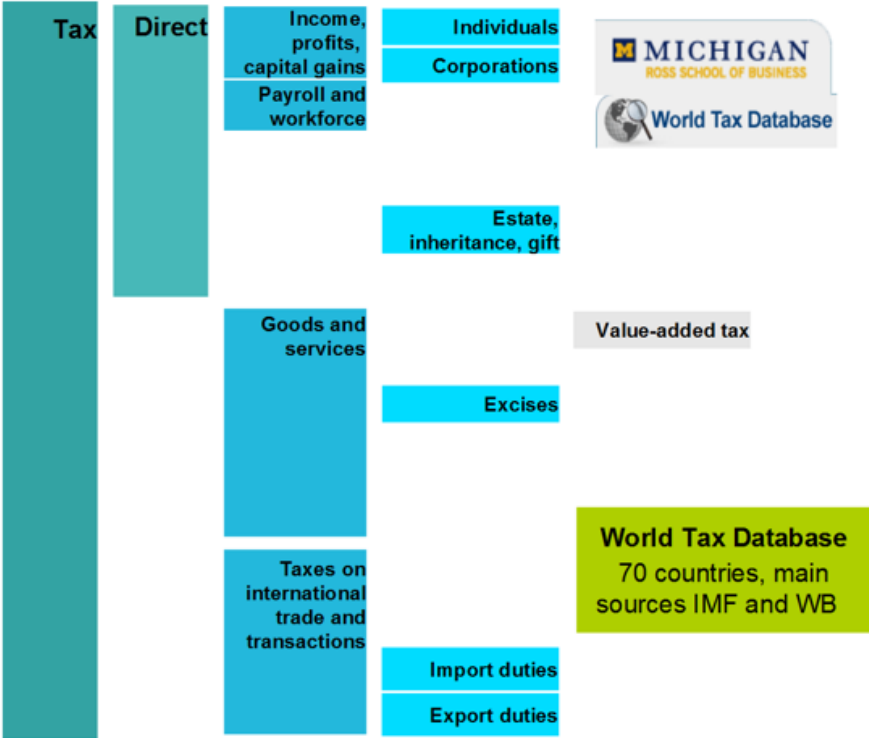
Figure A2.7 Structure of tax classification for Keen and Mansour (2009)



A2.7.2 World Tax Database from the University of Michigan Ross School of Business

The University of Michigan ran a project with backing from the Ford Foundation and the Lynde and Harry Bradley Foundation, to gather tax data from seventy countries around the world for the period 1970-1999. Data coverage for these countries and years is comparatively extensive, with a high degree of disaggregation. However, limited information is available about the sources and methodology used to build the database, beyond evidence that much of the data is derived from IMF and World Bank sources. As importantly, there appear to be important differences of classification relative to other sources, with the Michigan data frequently somewhat divergent from alternative international sources, thus reducing comparability. As a result, while data from the Michigan dataset has been included in comparative datasets underlying the ICTD GRD, the data has not been employed in the final researchers' datasets. The experience of this initiative also speaks indirectly to the challenges associated with maintaining research databases that adopt definitions of categories that are not fully congruent with the most prominent international data sources.

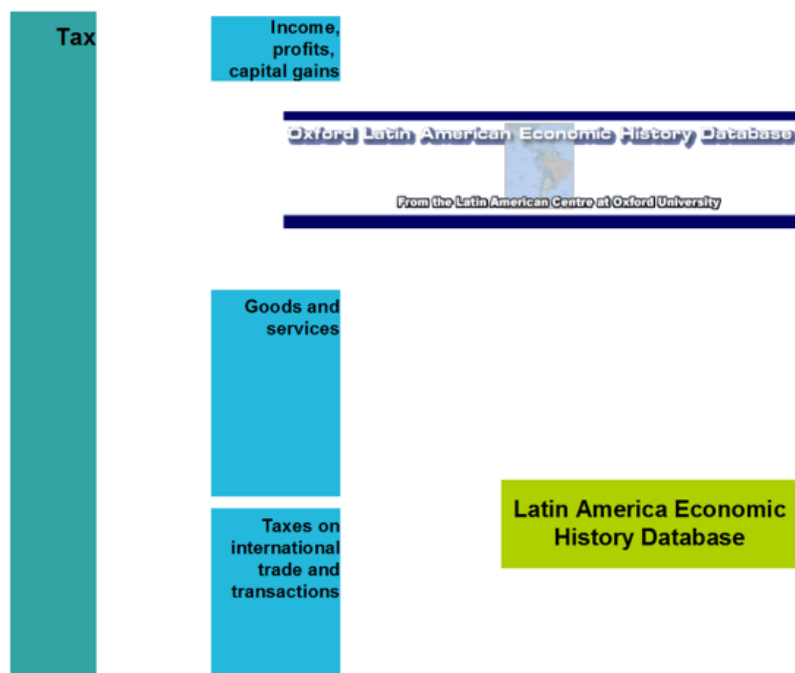
Figure A2.8 Structure of tax classification for the Michigan WTD



A2.7.3 Oxford Latin American Economic History Database (OxLAD)

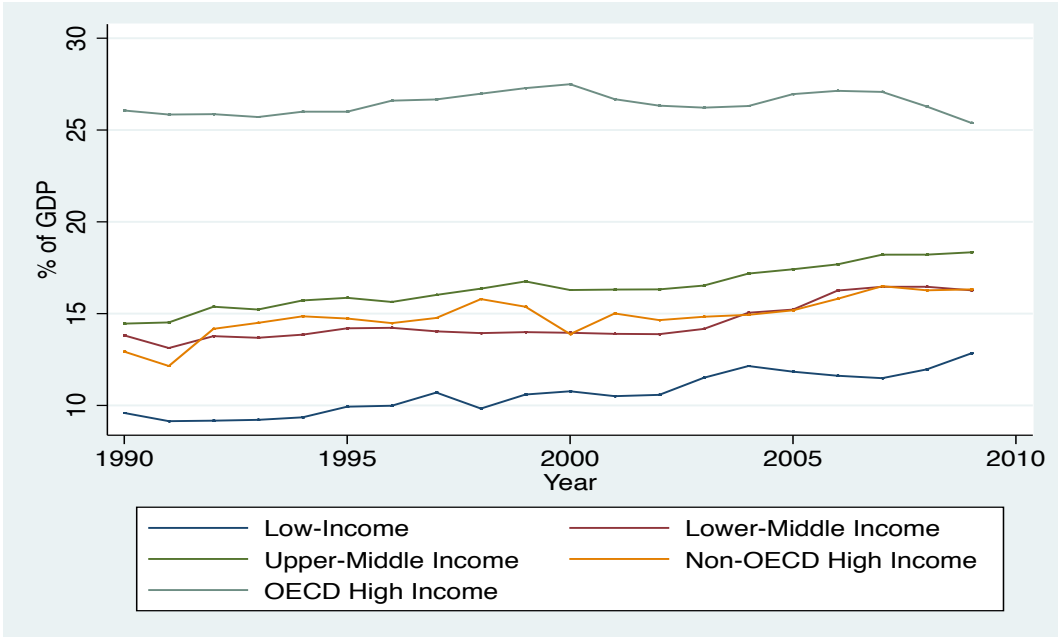
A final researcher dataset is the *Oxford Latin American Economic History Database*, which contains data for a limited number of tax variables covering the entire period 1900-1999. While impressive in its historical ambition, a lack of clarity about definitions and classification, the limited number of variables, and the curtailing of the dataset after 1999 present irreconcilable barriers to including the data in the final ICTD dataset.

Figure A2.9 Structure of tax classification for OxLAD



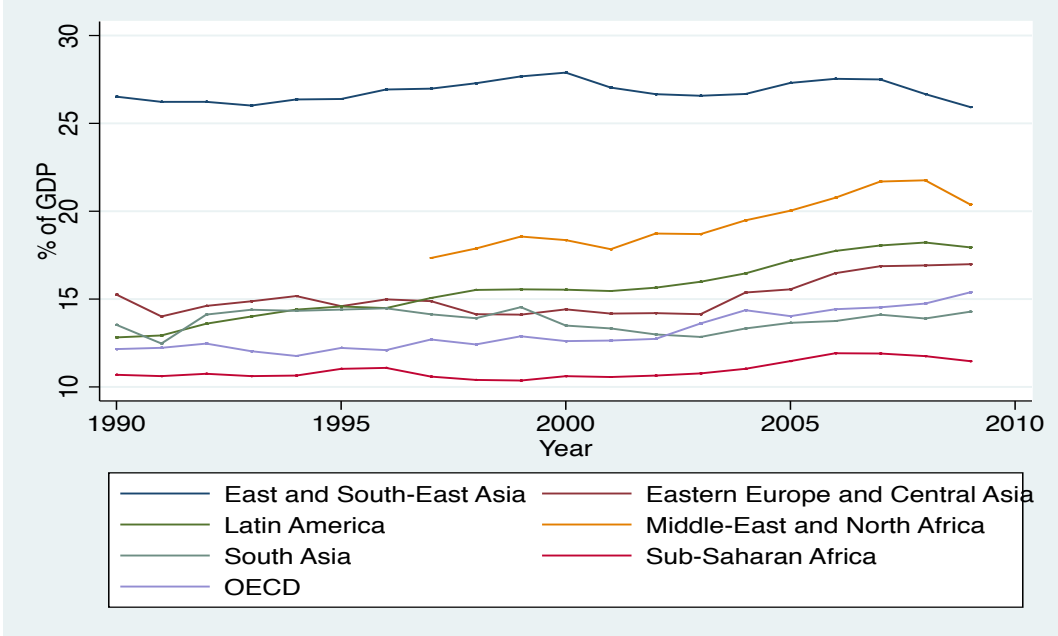
Appendix 3 Revenue trends over time

Figure A3.1 Total tax collection by income group 1990-2009



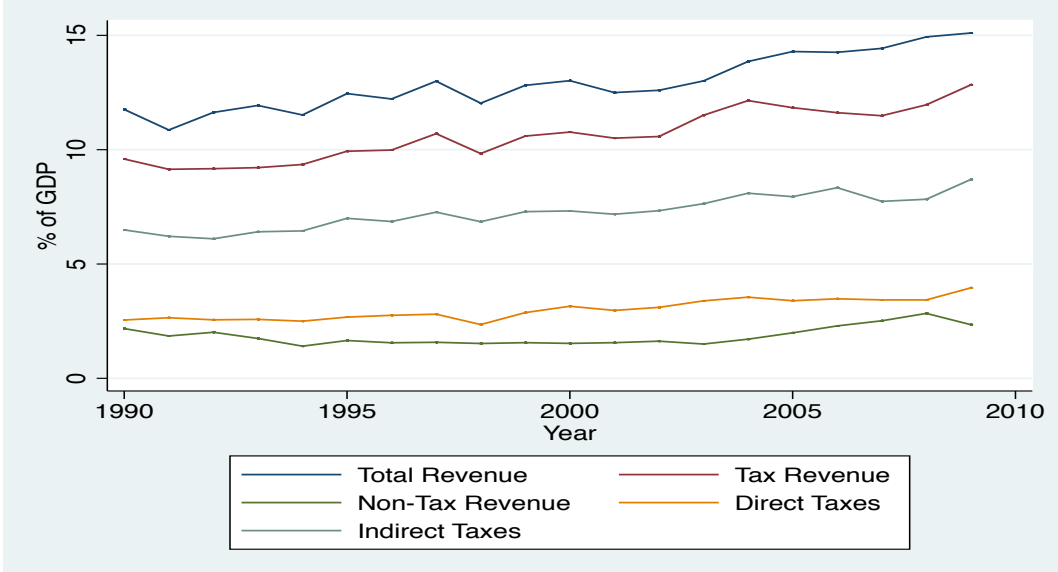
Notes: OECD High income includes all OECD countries excluding Mexico, Poland and Israel. Non-OECD high income includes Uruguay, Qatar, Aruba, Croatia, Lithuania, Brunei Darussalam, Malta, Trinidad and Tobago, Antigua and Barbuda, Barbados, Singapore, Cyprus, Kuwait, Equatorial Guinea, Hong Kong, St Kitts and Nevis, San Marino, the Bahamas and Bahrain. Low-income, lower middle-income and upper middle-income countries as detailed in figures for individual income groups below. Source: ICTD GRD (2014).

Figure A3.2 Total tax collection by region 1990-2009



Notes: OECD includes all OECD countries excluding Mexico, Poland and Israel. Countries for regional groups as detailed in figures below. Source: ICTD GRD (2014).

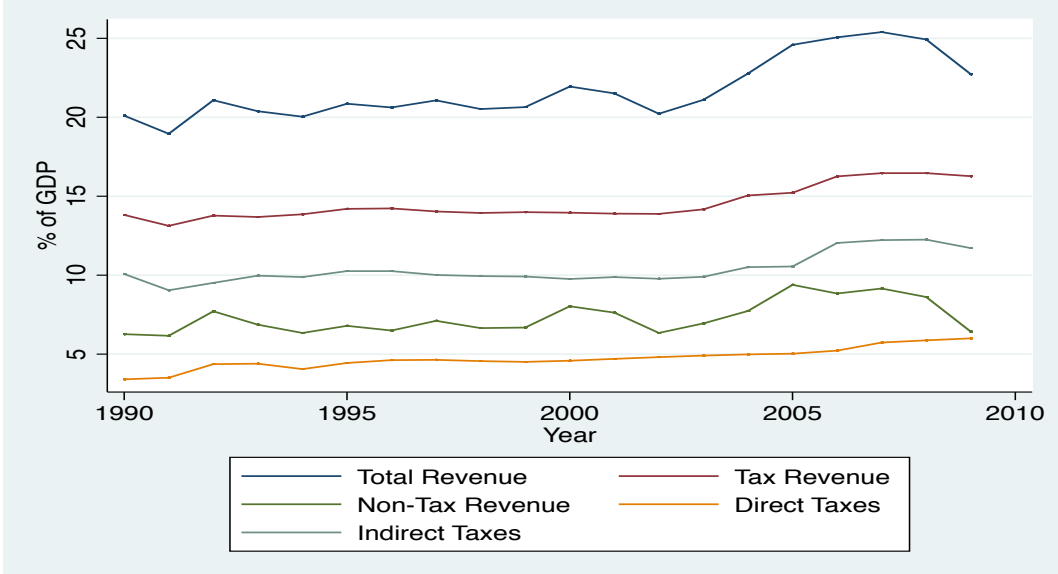
Figure A3.3 Revenue composition for low-income countries 1990-2009



Notes: Includes Tajikistan, Malawi, Uganda, Togo, Madagascar, Burkina Faso, Zimbabwe, Nepal, the Gambia, Tanzania, Guinea-Bissau, Kenya, Rwanda, Haiti, Burundi, Ethiopia, Comoros, Guinea, Mozambique, Bangladesh, Sierra Leone, Benin, Chad, Democratic Republic of the Congo and Kyrgyz Republic. Liberia, Eritrea, Somalia, Afghanistan and Cambodia are excluded owing to inconsistent data coverage. Analysis excludes 2010 because Haiti and Ethiopia drop out of the sample, causing a spurious upward trend.

Source: ICTD GRD (2014).

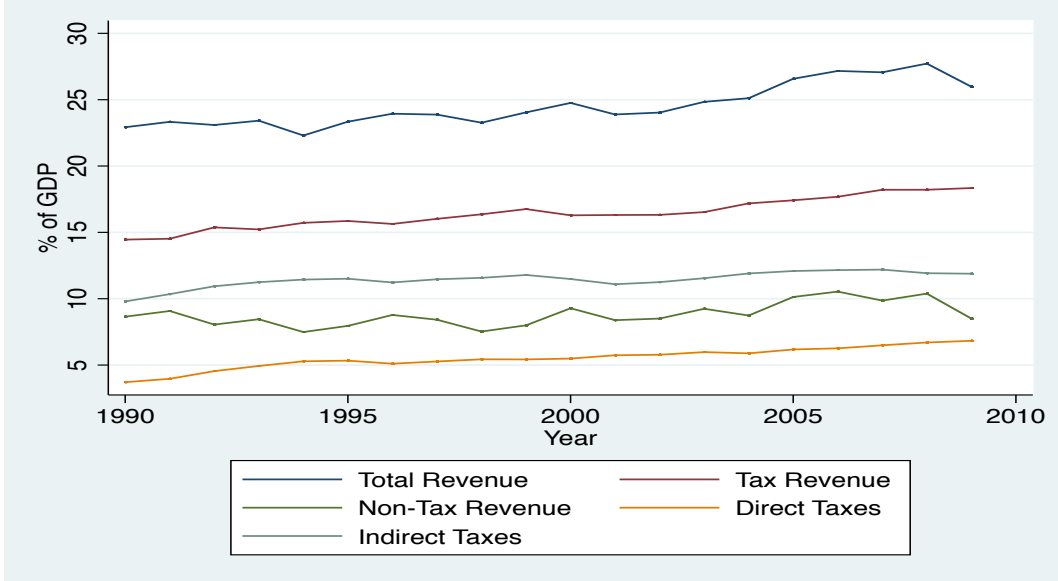
Figure A3.4 Revenue composition for lower middle-income countries 1990-2009



Notes: Includes Nigeria, Solomon Islands, Vanuatu, Paraguay, Lesotho, Yemen, Micronesia, Cape Verde, Bolivia, Honduras (no direct or indirect), Ghana, Guatemala, Nicaragua, Samoa, Philippines, Indonesia (no direct or indirect), Bhutan, Mauritania, Swaziland, Rep. Congo, Vietnam, Syria, Egypt, El Salvador, Sao Tome and Principe, Kiribati, Cameroon, Laos, Georgia, Pakistan, Papua New Guinea, India, Cote D'Ivoire, Sudan, Senegal, Sri Lanka, Djibouti and Ukraine. Armenia, Uzbekistan, Kosovo, Timor-Leste, Zambia and Guyana are excluded owing to inconsistent data coverage. Analysis for 2010 is excluded as resource-producing countries disproportionately drop out of the sample due to missing data.

Source: ICTD GRD (2014).

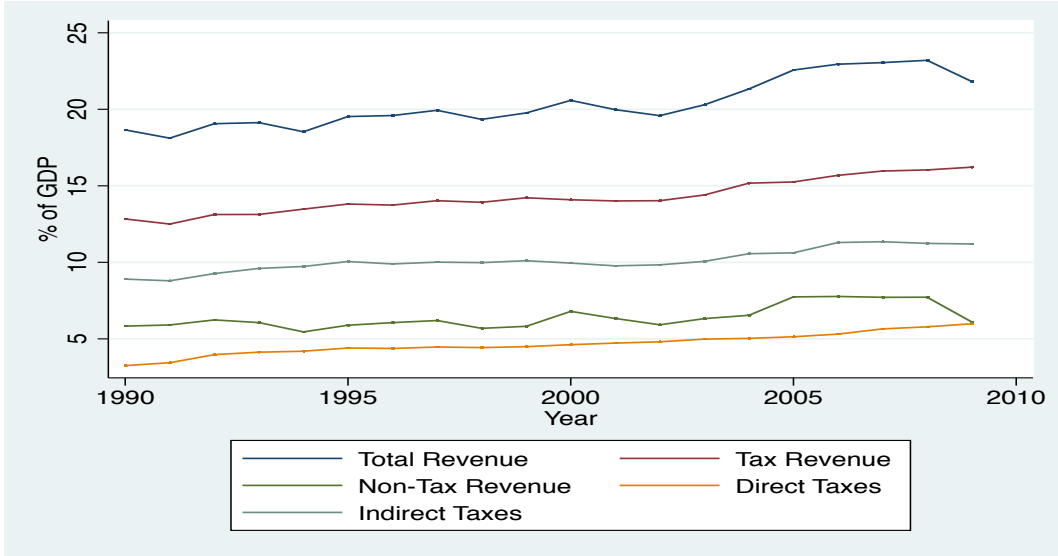
Figure A3.5 Revenue composition for upper middle-income countries 1990-2009



Notes: Includes Colombia, Fiji, Jamaica, Panama, Brazil, Malaysia, Venezuela, Palau, Tunisia, Algeria, Grenada, St. Lucia, Costa Rica, Belarus, Azerbaijan, Bulgaria, Iran, Gabon, China (no direct or indirect), Maldives, Belize, Angola, Marshal Islands, Lebanon, Mauritius, Turkey, Cuba, Namibia, Argentina, Seychelles, Libya (no direct or indirect), Jordan, Thailand, St. Vincent and the Grenadines, Albania, Ecuador, Hungary, Botswana, Mexico, Dominican Republic, Romania and Macedonia. Bosnia and Herzegovina, Iraq, Turkmenistan, Tuvalu, Montenegro, Kazakhstan and Serbia are excluded owing to inconsistent data coverage. Analysis for 2010 is excluded as resource-producing countries disproportionately drop out of the sample due to missing data.

Source: ICTD GRD (2014).

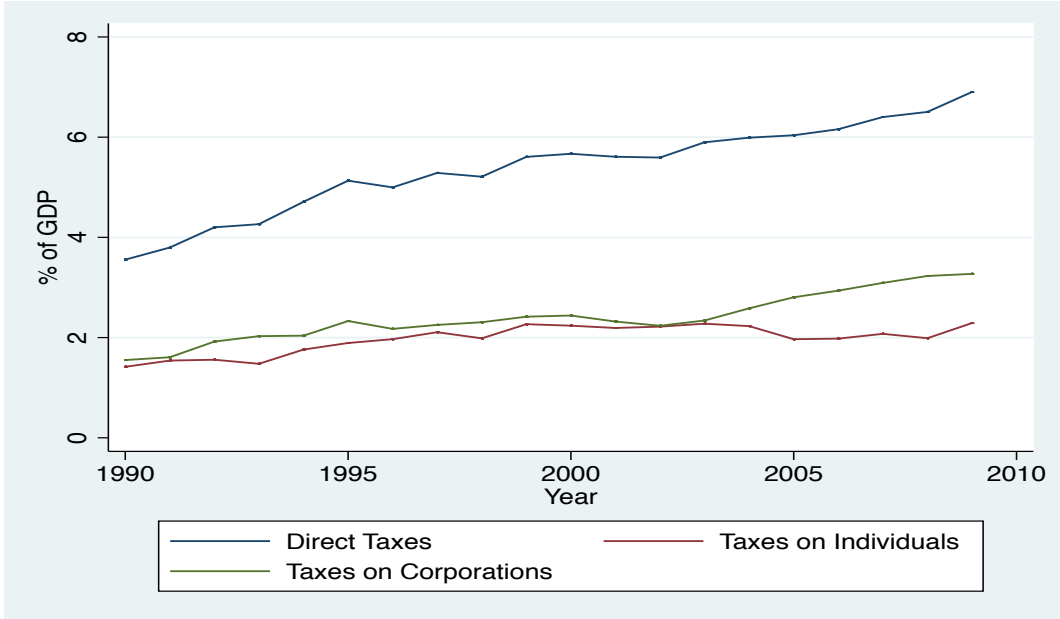
Figure A3.6 Revenue composition for all developing countries 1990-2009



Notes: Includes Nigeria, Colombia (no direct or indirect), Fiji, Solomon Islands, Nepal, Zimbabwe, Jamaica, Malawi, Tanzania, Panama, Brazil, Vanuatu, Paraguay, Malaysia, Lesotho, Yemen, Micronesia (no direct or indirect), Venezuela, Cape Verde, Burkina Faso, Palau, Comoros, Rwanda, Tunisia, Algeria, Grenada, Bolivia, Kenya, Honduras (no direct or indirect), Togo, St. Lucia, Costa Rica, Belarus, Ghana, Tajikistan, Azerbaijan (no direct or indirect), Guatemala, Bulgaria, Nicaragua, Iran, Uganda, Burundi, Mozambique, Samoa, Madagascar, Gabon, Philippines, Indonesia (no direct or indirect), China, Guinea-Bissau, Bhutan, Mauritania, Dem. Rep. Congo, Maldives, Belize, Angola, Marshall Islands, Swaziland, Rep. Congo, Vietnam, Lebanon, Bangladesh, Mauritius, Turkey, Cuba, Gambia, Namibia, Argentina, Syria, Egypt, Seychelles, Libya, Benin, El Salvador, Sao Tome and Principe, Jordan, Haiti, Kiribati (no direct or indirect), Thailand, Cameroon, Georgia, St Vincent and Grenadines, Pakistan, Niger, Albania, Papua New Guinea, Chad, India, Cote D'Ivoire, Ecuador, Sudan, Guinea, Senegal, Hungary, Botswana, Mexico, Dominican Republic, Sri Lanka, Sierra Leone, Djibouti, Ukraine, Ethiopia, Romania and Macedonia. Kazakhstan, Moldova, Serbia, Armenia, Kyrgyz Republic, Eritrea, Afghanistan, Bosnia and Herzegovina, Uzbekistan, Kosovo, Cambodia, Timor-Leste, Iraq, Montenegro, Zambia, Liberia, Korea Dem. Rep, Turkmenistan, Tuvalu, Guyana and Somalia are excluded owing to inconsistent data coverage. Analysis for 2010 is excluded as resource-producing countries disproportionately drop out of the sample due to missing data.

Source: ICTD GRD (2014).

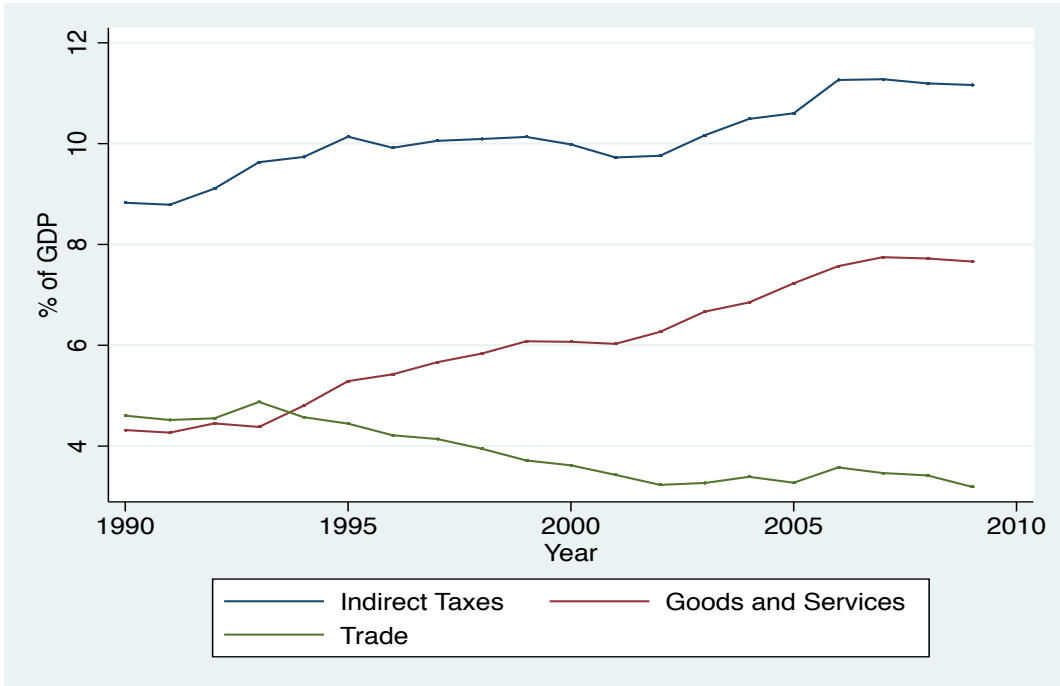
Figure A3.7 Composition of direct tax revenue for developing countries 1990-2009



Notes: Includes Philippines, Belarus, Turkey, Guatemala, Iran, Jordan, Papua New Guinea, Zimbabwe, St Vincent and the Grenadines, Jamaica, Albania, the Gambia, Namibia, Brazil, Mauritius, Nigeria, Dem. Rep. Congo, Dominican Republic, Benin, Sri Lanka, Guinea-Bissau, Maldives, Hungary, Panama, Romania, Paraguay, Swaziland, Seychelles, Egypt, Bhutan, Cuba, Ukraine, Bolivia, Argentina, Costa Rica and Lesotho.

Source: ICTD GRD (2014).

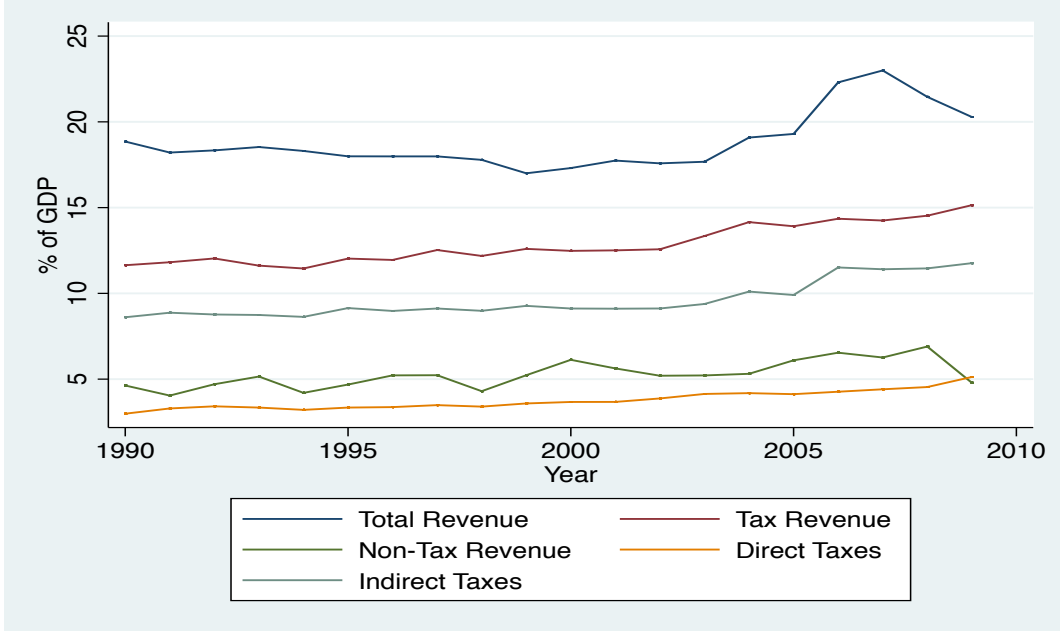
Figure A3.8 Composition of indirect tax revenue for developing countries 1990-2009



Notes: Includes Solomon Islands, Philippines, Belarus, Vanuatu, Rep. Congo, Turkey, Mozambique, Ghana, Guatemala, Gabon, Iran, Jordan, Papua New Guinea, Zimbabwe, St. Vincent and the Grenadines, Jamaica, El Salvador, Botswana, Grenada, Thailand, Albania, Haiti, the Gambia, Namibia, Brazil, Brazil, Mauritius, Nigeria, Dem. Rep. Congo, Algeria, Dominican Republic, Benin, Mauritania, Cameroon, Bangladesh, Sri Lanka, Kenya, Guinea-Bissau, Uganda, Tanzania, Venezuela, Maldives, Guinea, Hungary, Panama, St. Lucia, Romania, Burkina Faso, Paraguay, Cape Verde, Pakistan, Sierra Leone, Chad, Seychelles, Nepal, Egypt, Burundi, Tunisia, Nicaragua, Rwanda, Ecuador, Lebanon, Bhutan, Cuba, Belize, Ukraine, Bolivia, Argentina, Costa Rica, Mexico and Lesotho.

Source: ICTD GRD (2014).

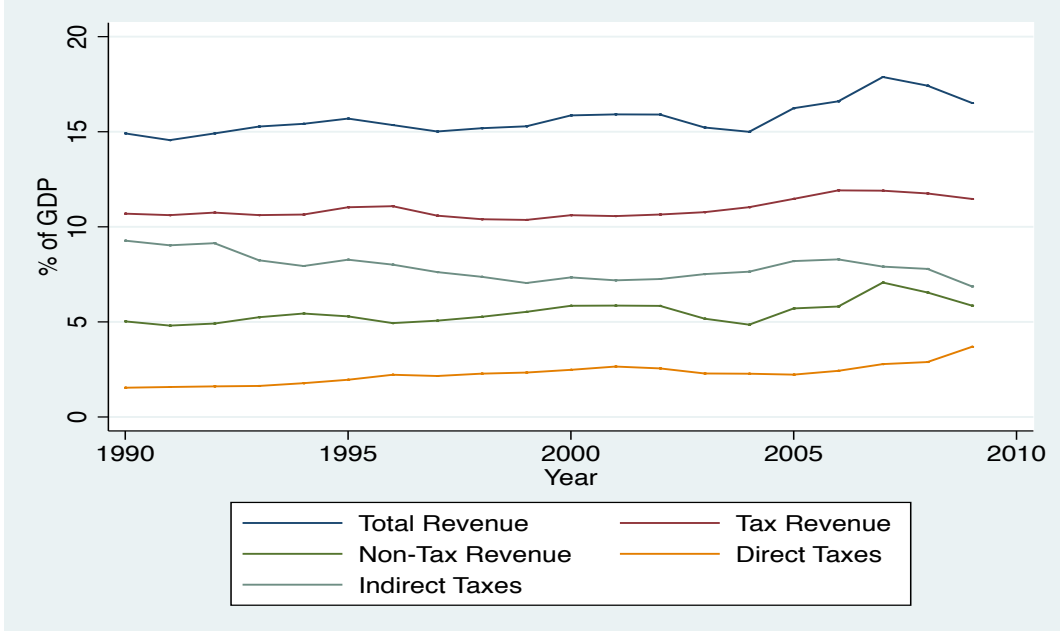
Figure A3.9 Revenue composition in Sub-Saharan Africa 1990-2009



Notes: Includes Tanzania, Rwanda, Madagascar, Cape Verde, Cote D'Ivoire, Namibia, Angola, Central African Republic, Lesotho, Niger, Senegal, Guinea-Bissau, Ethiopia, Malawi, Cameroon, Nigeria, Mauritania, Botswana, Benin, Burundi, Swaziland, Ghana, Zimbabwe, Togo, Mauritius, Comoros, Gabon, Republic of Congo, Burkina Faso, Uganda, Sudan, Chad, the Gambia, South Africa, Mali, Sierra Leone, Democratic Republic of the Congo, Kenya and Guinea. Liberia, Zambia and Eritrea are excluded owing to inconsistent data coverage. Analysis excludes 2010 because the loss of Nigeria, Angola and Gabon from the sample leads to a spurious fall in non-tax revenue.

Source: ICTD GRD (2014).

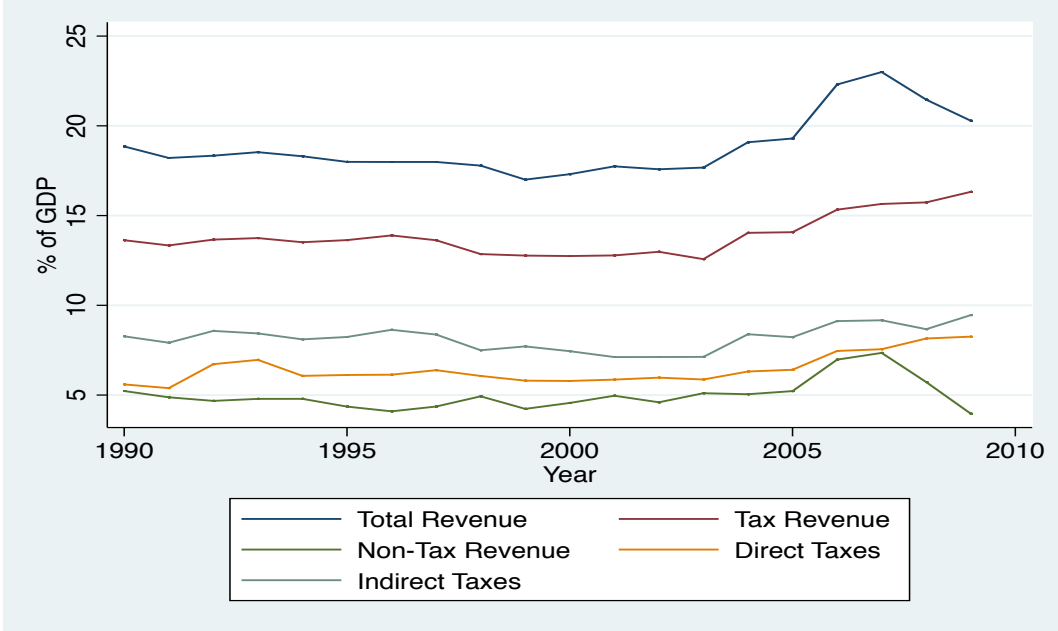
Figure A3.10 Revenue composition in South Asia 1990-2009



Notes: Includes Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. Afghanistan is excluded owing to inconsistent data coverage. Data for 2010 is excluded because the loss of Bhutan from the small sample of countries causes a marked downturn in non-tax revenue and upturn in tax revenue.

Source: ICTD GRD (2014).

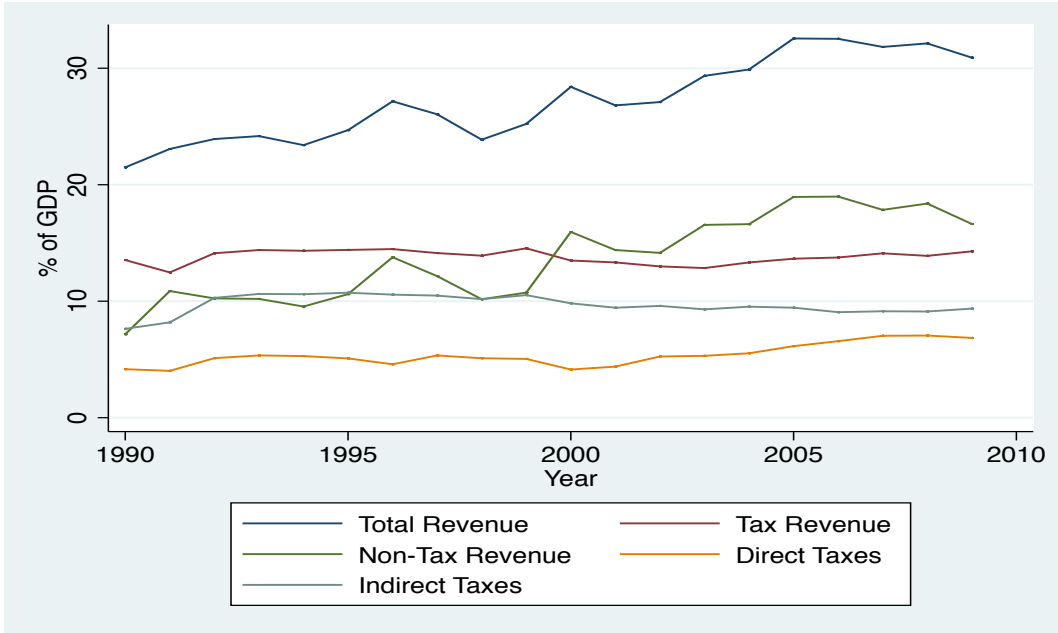
Figure A3.11 Revenue composition in East and South-East Asia 1990-2009



Note: Includes Myanmar, Laos, Malaysia, Indonesia, Thailand, Vietnam, China, Fiji, Papua New Guinea, Solomon Islands and Philippines. Cambodia is excluded because of inconsistent data coverage, while we also exclude Pacific islands with populations below 200,000 (Tuvalu, Palau, Tonga, Samoa, Marshall Islands and Kiribati) as they otherwise dominate the sample.

Source: ICTD GRD (2014).

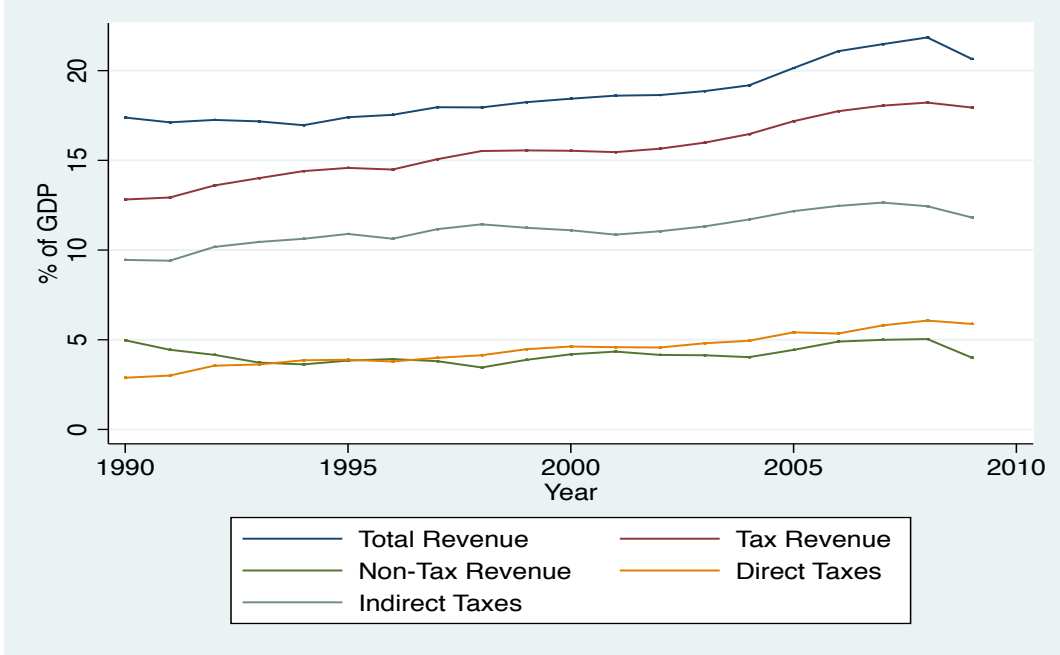
Figure A3.12 Revenue composition in the Middle East and North Africa 1990-2009



Notes: Includes Yemen, Morocco, Iran, Lebanon, Djibouti, Algeria, Syria, Libya, Jordan, Tunisia and Egypt. Iraq is excluded owing to inconsistent data coverage and problems excluding resource revenue. The smaller oil states in the Gulf (Saudi Arabia, Kuwait, Bahrain, UAE and Qatar) are classified as a separate region by the World Bank.

Source: ICTD GRD (2014).

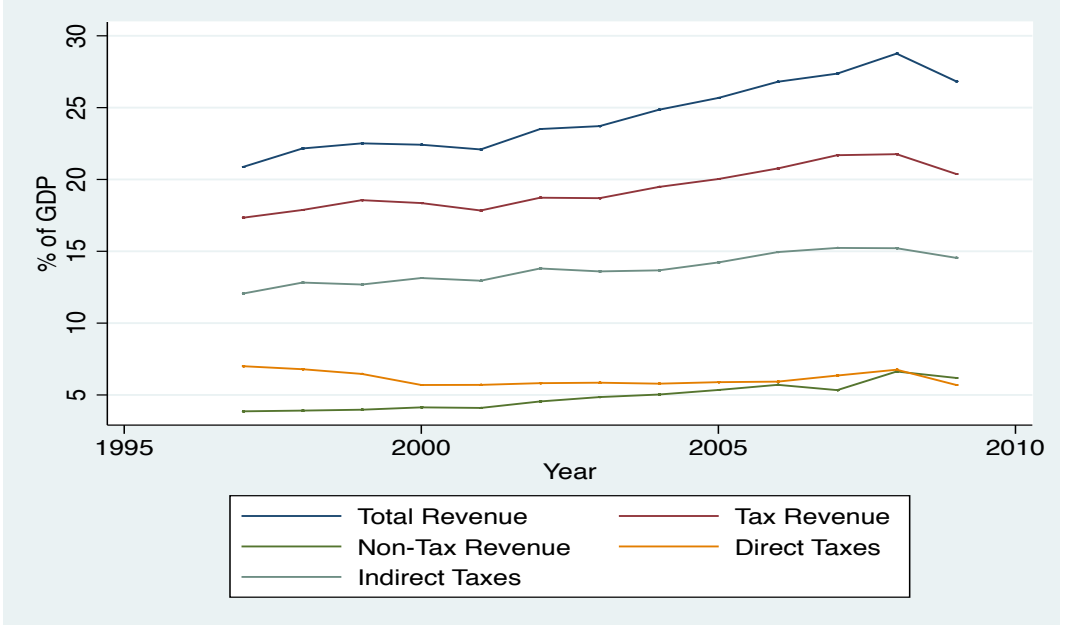
Figure A3.13 Revenue composition in Latin America 1990-2009



Note: Includes Argentina, Belize, Uruguay, Honduras, Dominican Republic, Ecuador, Colombia (no direct and indirect), Chile, Bolivia, Guatemala, Venezuela, Brazil, Haiti, El Salvador, Nicaragua, Mexico, Cuba, Paraguay, Costa Rica and Panama. Peru is excluded due to an inability to exclude resource revenue effectively, and Guyana is excluded owing to inconsistent data coverage. Time series for 2010 is excluded owing to a sharp decline in the availability of data for direct and indirect taxes because of a shift in available data sources at the time of compilation.

Source: ICTD GRD (2014).

Figure A3.14 Revenue composition in Eastern Europe and Central Asia 1990-2009



Note: Includes Belarus, Tajikistan, Azerbaijan, Montenegro, Ukraine, Turkey, Bulgaria, Albania, Bosnia and Herzegovina, Moldova, Slovak Republic, Serbia, Lithuania, Romania, Armenia, Macedonia, Latvia, Georgia, and Kyrgyz Republic (excluding direct and indirect). Uzbekistan, Turkmenistan, Kosovo, Kazakhstan and Russia are excluded due to inconsistent data coverage. Analysis begins after 1996 owing to very incomplete data coverage in earlier years.

Source: ICTD GRD (2014).

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