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CONTENTS

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CONTENTS CONTINUED

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Corruption, taxes and compliance

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Abstract
This article revisits the effects of corruption on the state's capacity to raise revenue, building on the existing empirical literature using new and more disaggregated data. We use a comprehensive dataset for 147 countries spanning 1995-2014, compiled by the International Monetary Fund. The study finds that—consistent with the existing literature—corruption is negatively associated with overall tax revenue, and most of its components. This relationship is predominantly influenced by the way corruption interacts with tax compliance. The establishment of large taxpayer offices within revenue administrations improves tax compliance by dampening the perception of corruption, thereby boosting revenue.

Keywords: taxation, compliance, corruption

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1. INTRODUCTION

States that do not raise adequate revenues are unable to build institutions to support economic development (Besley & Persson, 2014). In a recent study, Gaspar, Jaramillo, and Wingender (2016) show that once the tax-to-GDP ratio reaches around 15 per cent, GDP per capita increases sharply, a threshold that several developing countries have not yet crossed. Determinants for why revenue mobilisation might be lagging are many, and the literature repeatedly and increasingly identifies corruption as one of the factors.

In this article, we revisit the effects of corruption on the state's capacity to raise revenue, building on the existing empirical literature with new and more disaggregated data. We use a comprehensive dataset for 147 countries spanning 1995-2014, compiled by the International Monetary Fund (IMF). The data are disaggregated by revenue type: taxes on personal and corporate income, social security, property, goods and services, and international trade. The robustness of these results is then tested against another data source. In this regard, this article is the first to make use of data generated by two IMF tools to benchmark countries' tax performance, the Revenue Administration–Fiscal Information Tool (RA-FIT) and to assess actual tax collection *vis-à-vis* the potential, the IMF's Revenue Administration Gap Program (RA-GAP).

Another novelty of this study is the analysis of the impact of establishing public institutions designed to improve tax compliance. For the first time, a comprehensive dataset for the establishment of 'specialised' taxpayer offices—both large and medium-sized—within revenue administrations and anti-corruption agencies is compiled. It has been argued that establishing such institutions should be part of an anti-corruption strategy (IMF, 2016).

We find that, consistent with the existing literature, corruption is negatively associated with overall tax revenue, and most of its components. This relationship is predominantly influenced by the way corruption interacts with tax compliance. Building on this relationship, we assess the possibility of improving tax compliance via strengthening institutions, specifically those focusing on taxpayer segmentation. When properly implemented, segmentation by taxpayers could lead to better focus on managing the unique compliance risks presented by the respective segments, thereby reducing the perception of corruption and increasing taxpayer compliance. Our results indicate that this is indeed the case.

The rest of the article is structured as follows. Section 2 briefly reviews the existing literature. Section 4 describes a series of key stylised facts. The dataset is presented in section 3. The empirical methodology and the results are discussed in sections 5 and 6. Section 7 concludes.

2. LITERATURE REVIEW

Over the previous decades, there has been a prolific literature—both theoretical and empirical—on the relationship between corruption and taxation. This literature finds, first, that widespread corruption harms the culture of compliance, thereby increasing tax evasion (Aghion et al., 2016). Tax exemptions perceived to be the result of a bribe undermine the trust in government and the compliance with tax laws (Dreher &

Herzfeld, 2005); Second, corruption fosters the development of the informal sector, and therefore erodes the potential tax base (Schneider, 2005; Schneider & Denste, 2000).

Many papers have studied the direct influence of corruption on revenue performance (see Table 1), and most find a negative relationship between corruption and tax revenue. Sen Gupta (2007) finds that, among other factors (such as per capita GDP, the ratio of agriculture to GDP, trade openness and foreign aid), corruption is a significant determinant of a country's revenue performance. More recently, Besley and Persson (2014) discuss why developing countries tax so little, examining considerations such as the economic structure of these economies, political factors (including strength of institutions, fragmented politics, and a lack of transparency due to weak news media), and sociological and cultural influences (such as a weak sense of national identity and a poor norm for compliance). The authors find a strong negative correlation between corruption and the tax revenue-to-GDP ratio. They attribute this correlation to corrupt systems of government that face resistance to increasing taxes.

However, due to data limitations, few empirical studies have considered the effect of corruption on different tax types. These studies suggest that indirect taxes requiring frequent interactions between tax authorities and individuals are more prone to corruption (Hwang, 2002, Attila, Chambsa & Combes, 2009; Thornton, 2008; Imam & Jacobs, 2014). For example, taxes on international trade, which are an important source of revenue for developing countries, are negatively and statistically significantly affected by corruption. Furthermore, corruption tends to increase the share of international trade taxes to total tax revenues. Similarly, the impact of corruption on taxation of goods and services (such as value added tax (VAT) and excise) is found to be statistically significant (Attila et al., 2009; Thornton, 2008; Imam & Jacobs, 2014). Estimates for direct taxes are mixed: both personal and corporate income taxes are found to be insignificantly impacted by corruption by Attila et al. (2009) and Thornton (2008), and only Imam and Jacobs (2014) find a negative impact on corporate taxes in the Middle East. Though these papers attempt to solve the endogeneity issue (see the empirical analysis and discussion in section 5 below), they remain focused on regions where tax collection has historically been weaker.

Table 1: Literature Summary of Panel Estimation Techniques for the Impact of Corruption on Public Revenue

	Period	Countries	Corruption Indices	Estimation method	Dependent Variables*	Corruption Impact	Control Variables	Instruments for Corruption
Ghura (2002)	1985 – 1996	39 SSA countries	International Country Risk Guide (ICRG)	Feasible instrumental variable generalised least squares (IV-GLS)	Total government revenue	(-)	Per capita GDP (/) Agriculture (-) Openness (+) CPI (-) Dummy for non-oil mining (+) Dummy for oil producer (+) REER (nl) Structural Reforms (+) Human capital (+)	Contemporaneous, squared, and lagged values of population, population growth, urbanisation rate, and the remaining as exogenous treated regressors
Hwang (2002)	1979 – 1995	41-66 countries	5 indices; Business International (80-83, Levine-Loayza-Beck (1999) data set that is averaged over 1982 – 1995, 3 indices based on Transparency International (TI)	OLS, FE 2SLS and SURE for four years (1980, 1985, 1990 and 1995)	Total revenue excluding grants Tax revenue Trade revenue (measured as a share to government revenue)	(-) (-) (-)	Real GDP per capita in 1979-80 (nl) Import volume in 1979 (/) Government consumption in 1980) (+)	Percent of population professing protestant faith, a dummy for a former British colony or UK, and an index of ethnolinguistic fractionalisation
Sen Gupta (2007)	1980 – 2004	105 countries	ICRG Index	Fixed, random effect panel and GMM type estimations	Total revenue excluding grants	(/)	Per capita GDP in PPP (+) Agriculture, value-added (% of GDP) (-) Imports (% of GDP) Aid (% of GNI) (+) Debt (% of GNI_ (nl) Goods and services tax (-) Total income tax (+) Trade tax (nl) Highest marginal tax rate, individual rate (%) (nl) Highest marginal tax rate, corporate rate (%) (nl) Average tariff (nl) Political stability (-) Economic stability (-) Law and order (nl) Government stability (nl) Dummies for landlocked and resource-rich countries	Not discussed for FE/RE model. GMM: Lagged levels of the dependent variable and the predetermined variables and differences of strictly exogenous variables

	Period	Countries	Corruption Indices	Estimation method	Dependent Variables*	Corruption Impact	Control Variables	Instruments for Corruption
Thornton (2008)	1984 – 2001	53 Middle East and African countries	World Bank's control of corruption index	OLS and 2SLS	Tax revenue Personal income tax Corporate income tax Social security Payroll tax Property tax Goods and service tax Trade taxes	(-) (nl) (nl) (-) (nl) (/) (/) (-)	Per capita GDP (+) Dummies for Middle East and North Africa (/)	Openness, black market foreign exchange premium, index of ethnic fractionalisation, and a dummy for oil-rich countries
Attila et al. (2008)	1980 – 2002	125 countries	ICRG Index	OLS and IV-GMM	Tax revenue VAT (as a share to tax revenue) Income tax (as a share to tax revenue) Tariff income (as a share to tax revenue)	(-) (-) (nl) (+)	GDP per capita (/) Trade openness (+) Inflation (-) Money supply M2 (-) Child mortality rate (/) Primary school completion rate (/) Primary school enrolment ratio (/) Secondary enrolment ratio (/) Years of primary education (/) Dummies for regions	Ethnolinguistic fragmentation, legal origins (French and British), distance from the equator and urbanisation rate
Imam and Jacobs (2014)	1990 – 2003	12 Middle East countries	ICRG Index	System-GMM	Tax revenue Total income tax Personal income tax Corporate income tax Social security Payroll tax Property tax Excise tax Goods and service tax Trade taxes Import duties Export taxes	(nl) (nl) (nl) (-) (nl) (-) (nl) (-) (nl) (-) (-) (-)	Per capita GDP (/) Agriculture (-) Openness (/) CPI (/)	GMM type instruments

Note: *Ratio to GDP, unless otherwise indicated.

Impact: (nl) no significant impact; (+) significantly positive; (-) significantly negative; (/) depends on the specification/ambiguous.

Much of the negative correlation between tax revenue and corruption comes from the effect corruption has on tax compliance, which constitutes the second focus of this article. A revenue administration reform that aims at compliance improvements is the establishment of specialised taxpayer offices, focusing on taxpayers with different characteristics and different risks to revenue. Such segmentation, primarily but not only by size, enables the distinct compliance risks various types of taxpayers pose to be addressed most effectively. For example, IMF (2015) lists effective monitoring of large taxpayers as one way to address compliance deficits. This specialisation may be reinforced by segmentation into economic sector to improve knowledge of personnel on sector-specific issues (e.g., for extractive industries, financial institutions, or telecommunications companies). By building specialised tax offices with the specialist skills to service distinct taxpayer segments, compliance and service can be enhanced, perceptions of corruption reduced and tax yield raised. Focusing on the largest taxpayers can be an important signal to the taxpaying public of the government's commitment to enforcing the tax laws, thereby lowering the perception of corruption.

There is some anecdotal evidence that large taxpayer offices (LTOs) improve compliance, and thus increase tax revenue (Imam & Jacobs, 2014). Ebrill et al. (2001) show that countries with LTOs have generally performed better in terms of VAT revenue collection than those without one. Ebeke, Mansour and Rota Graziosi (2016), on the other hand, find that LTOs have no significant direct impact on tax revenues, but are a precondition for other revenue-increasing tax policy and administrative measures, such as those relating to VAT. They employ a propensity score matching (PSM) method on a group of sub-Saharan African countries. We build on the PSM methodology, extending the LTO dataset to more than 100 countries, while also adding data for medium and small taxpayer offices (grouped with the acronym MTO here), as well as anti-corruption agencies (ACAs).

3. DATASET

We predominantly rely on the World Revenue Longitudinal Database (WoRLD),[5] which has been put together at the IMF and comprises data on total revenue, taxes on individual income, corporate income, goods and services, and international trade, as well as social security contributions. The dataset is compiled from multiple sources and covers 147 countries (both advanced and developing) between 1995 and 2014.[6] We conduct a robustness check with revenue data compiled by the International Centre for Tax and Development (ICTD), whose results are presented in Appendix 3.[7] All the revenue data are presented as a percentage of nominal gross domestic product (GDP).

[5] http://data.imf.org/?sk=77413F1D-1525-450A-A23A-47AEED40FE78.
[6] The sources are IMF country reports, Government Finance Statistics (GFS), World Economic Outlook (WEO) and the Organisation for Economic Co-operation and Development (OECD).
[7] The ICTD Government Revenue Dataset (GRD) combines data from several international sources to compile a comprehensive database. The data includes 50 revenue indicators and global coverage. There are some methodological and source differences between the ICTD data and WoRLD, making it a strong candidate for robustness checks.

In addition to the WoRLD database, we use data from the IMF's Revenue Administration Gap Program (RA-GAP) and the Revenue Administration–Fiscal Information Tool (RA-FIT).[8] The RA-GAP program has been applied to 23 countries to evaluate the difference between potential and actual collection of VAT between 2003 and 2013. RA-FIT is a web-based data gathering tool used to establish a baseline for revenue administration performance, to facilitate comparative study and benchmarking. There are over 140 countries included in this tool with hundreds of variables on revenue collection services, revenue authority staffing, tax base registration, dispute resolution, auditing and verification, among others. The surveys have been conducted over the past five years and country specific data are currently not publicly available.

The dates of establishment of LTOs, MTOs and ACAs are identified for more than 100 countries, making it the largest information set on LTOs and MTOs currently available. The data draws on information from IMF teams working on these countries and their reports, as well as country officials, websites of revenue authorities or finance ministries, and other online sources. In addition, we cross-checked the results with dates presented for subsets of countries in Baer (2002), Fossat and Bua (2013), and Ebeke et al. (2016). Appendix 4 summarises the results. Overall, we collect dates (or verify their non-existence) for 109 LTOs, 62 MTOs and 77 ACAs.

We primarily use two corruption measures throughout this article, the Corruption Perception Index by Transparency International (TI) and the World Bank's Control of Corruption Index. Both indices measure the perception of corruption, defined as the misuse of public power for private benefit, and cover about 180 countries. The two indicators differ in the sources used and specific questions asked to survey participants. Both are primarily perception-based, which has been criticised across the literature since actual and perceived levels of corruption might differ significantly. In the absence of measures for actual levels of corruption, and given that tax evasion might be equally impacted by the perception of corruption, the indices here are taken as proxies for actual corruption. In addition, while highly correlated, the indices have been subject to methodological changes over time (for example, the TI Corruption Perception Index underwent a significant change in 2012). For this reason, both indicators are used to verify the robustness of the results. The corruption variables have been rescaled to indicate that higher values are associated with greater corruption.

4. STYLISED FACTS

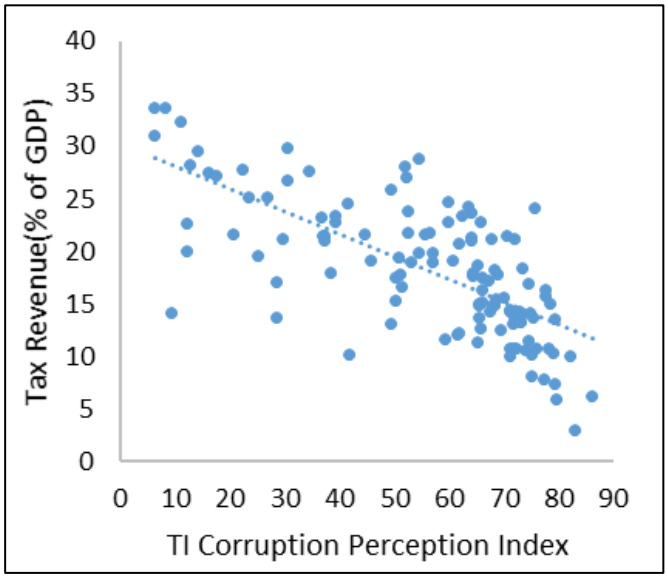
At the outset, we look at the correlation between corruption, tax revenue, and compliance indicators. Total tax revenue is negatively correlated with the

[8] For details on RA-GAP see Hutton (2017). For an example, see:
https://www.imf.org/en/Publications/CR/Issues/2016/12/31/South-Africa-Technical-Assistance-Report-Revenue-Administration-Gap-Analysis-Program-The-43069;
and for details on RA-FIT see Lemgruber, Masters and Cleary (2015) and
https://www.imf.org/external/np/seminars/eng/2013/asiatax/pdfs/masters.pdf.

Transparency International Corruption index (Figure 1),[9] which implies that increased corruption is associated with lower levels of the tax-to-GDP ratio.

A disaggregation of data into individual income and corporate income taxes shows that the former is more strongly negatively correlated with corruption (Figure 2, Panels A and B). Large corporate enterprises often fall under the supervision of LTOs and are part of the formal sector, in contrast to smaller enterprises, which could partly explain this result. Furthermore, the scope for discretion tends to be more pronounced in the case of personal income tax (Besley & Persson, 2014). For individual income tax, the perception of corruption lowers the willingness of individual taxpayers to comply fully with tax laws because of the perception that their taxes will be misused by the authorities.

Figure 1: Total Tax Revenue (1995-2014, period average)



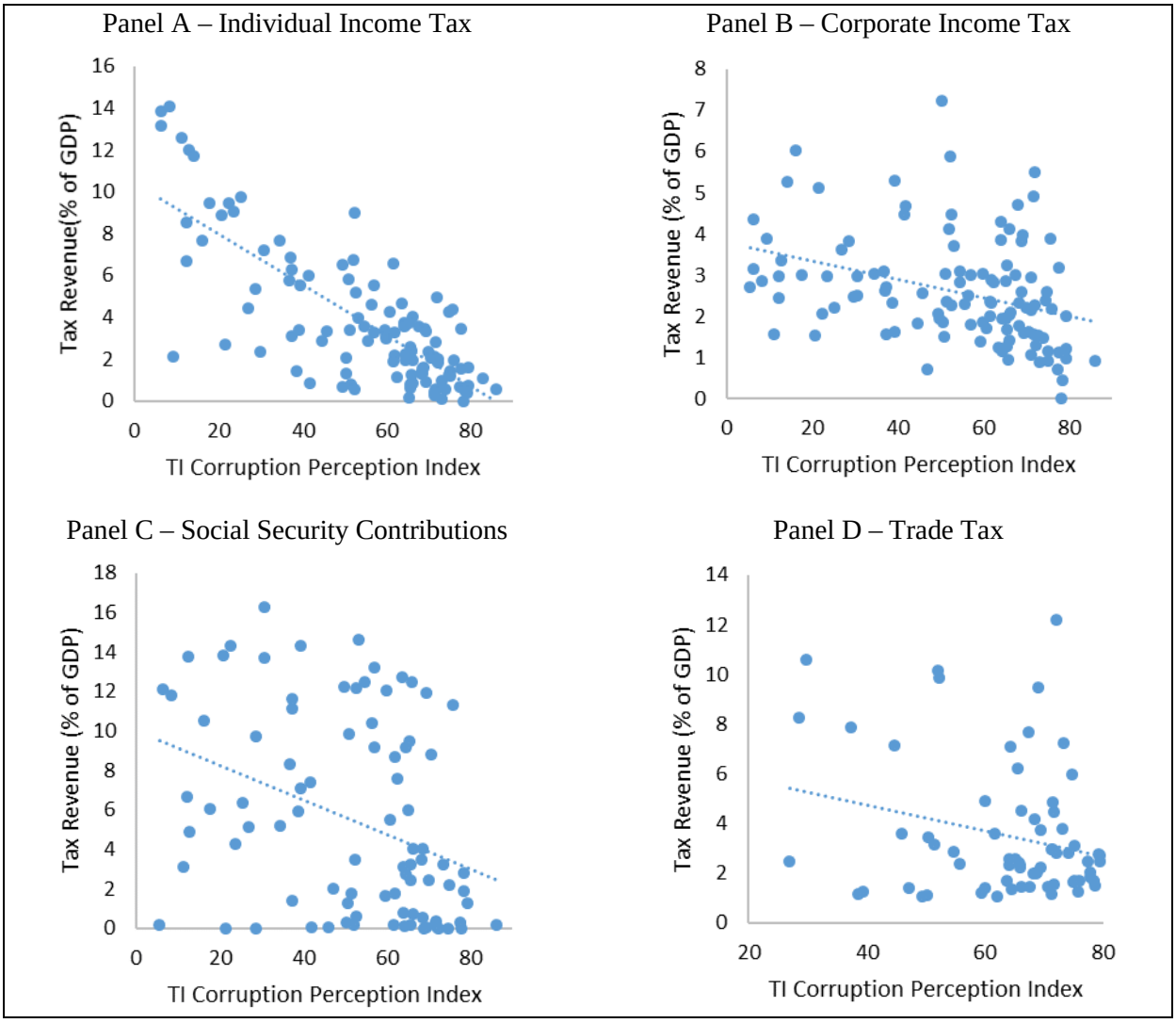
Sources: Transparency International, IMF WoRLD Database.

Panel C in Figure 2 shows a negative correlation between corruption and social security contributions. This is likely attributable to a characteristic of the informal sector in many countries, leading individuals and small and medium-sized enterprises to not meet their social security obligations. For international trade (Figure 2, Panel D), the negative correlation with corruption reflects the delays that traders face at the border and bribes they are asked to pay to clear their goods.

Ideally, one would like to go beyond the correlation between tax revenue and corruption by analysing compliance for different taxes. Data on the VAT's C-efficiency ratio offers such an analysis. The C-efficiency ratio compares the actual VAT revenue with its potential when a uniform tax rate is applied to all consumption. A shortfall in the former (i.e., a ratio less than 1) is influenced by both VAT design and compliance. Data for 108 countries shows that there is a strong correlation between a lower C-efficiency and a higher perception of corruption (Figure 3, Panel A).

[9] Similar results are found when the World Bank Control of Corruption index is used.

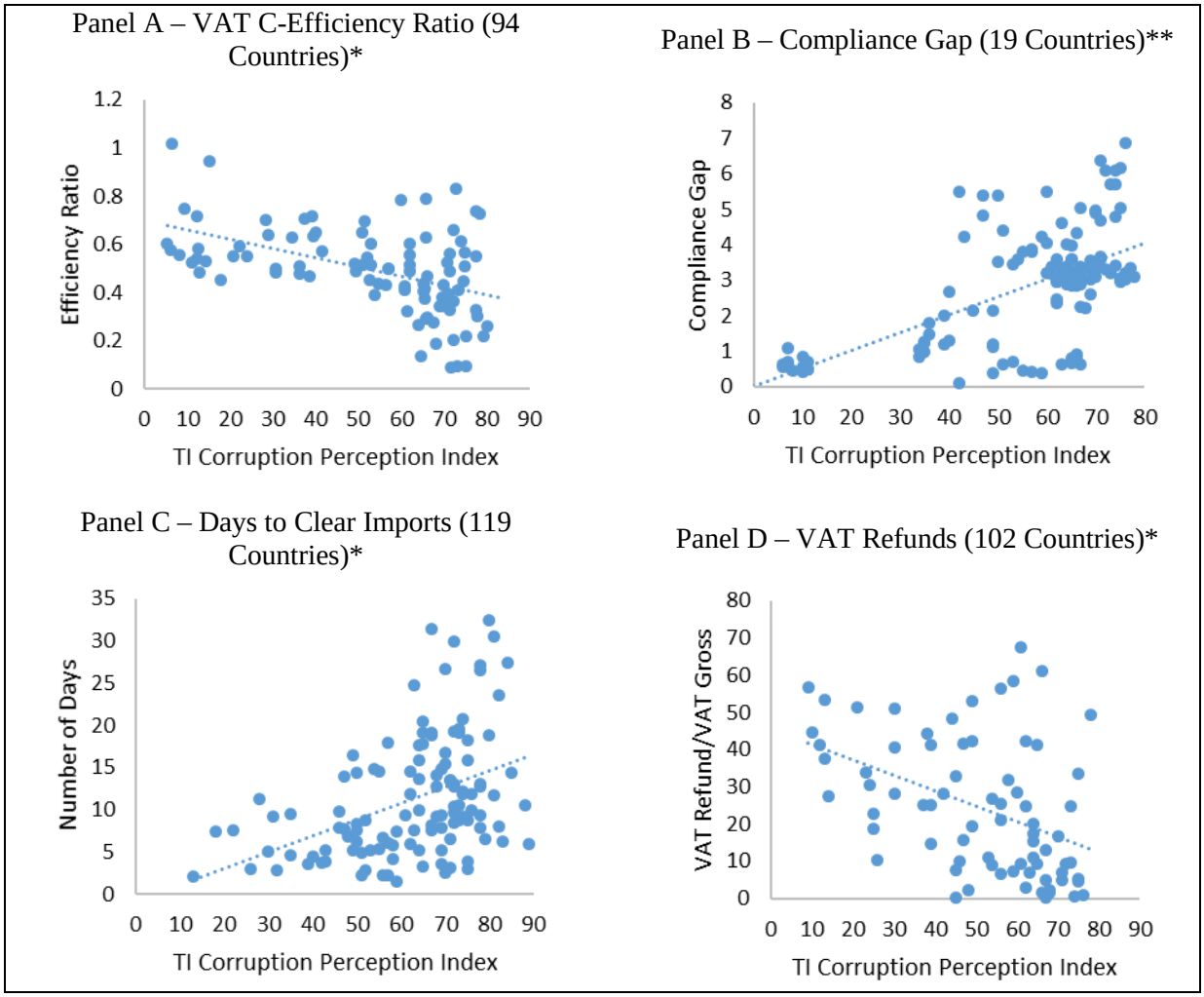
Figure 2: Tax Revenue Components and Corruption (1995-2014, period average)



Sources: Transparency International, IMF Staff Estimates.

As noted above, the RA-GAP program has generated data on the VAT compliance gap for 23 countries. When plotted against the level of perceived corruption (Figure 3, Panel B), we find a positive relationship, that is, the higher the level of perceived corruption, the larger is the VAT compliance gap. In addition, Panel C of Figure 3 shows that for countries with higher perceived corruption, more days are required to clear imports through customs, as importers go through unofficial channels to get their items released. Finally, we find the relationship between corruption and VAT refunds to be negative (Figure 3, Panel D) — a result that confirms problems with getting VAT refunds in more corrupt countries.

Figure 3: Tax Compliance and Corruption



*: Data spans 1995-2014, and points represent the period average for each country.

**: Data represents between 4 and 8 observations in the years 2004-2013 for each country.

Sources: Transparency International, IMF RA-GAP, IMF RA-FIT, IMF Staff Estimates.

5. REVISITING THE IMPACT OF CORRUPTION ON TAX REVENUE

5.1 Empirical methodology – panel techniques

This empirical section assesses the effect of corruption on tax revenue. The following equation is estimated:

$$y_{it} = \alpha_i + \lambda_t + \beta * Corruption_{it} + \sum_n^k (\theta_k * X_{it}^k) + \epsilon_{it} \quad (1)$$

where y_{it} is the tax revenue-to-GDP ratio for a country i at time t, and $Corruption_{it}$ represents a measure of corruption. The regressor X_{it}^k represents a set of k control variables, which, following the literature (Baunsgaard & Keen, 2010), include proxies

of the development level, the size of the tax base, the degree of openness, and the macroeconomic environment. α_i and λ_t represent a full set of country and time fixed effects, respectively. ϵ_{it} is the error term. For our controls, we use trade openness, which is the value of the total imports and exports as a percentage of GDP, as well as inflation, the share of agriculture in the economy, and GDP per capita in purchasing power parity terms.[10]

Estimating equation (1) is challenging because of potential reverse causality between corruption and taxation. High taxation could encourage tax evasion and low tax capacity could favour corrupt behaviour. To address this endogeneity issue, the literature has applied different instrumental variable approaches (Ghura, 2002; Hwang, 2002; Attila et al., 2009; Thornton, 2008). In its IV-GLS procedure, the study by Ghura (2002) uses the contemporaneous, squared, and lagged values of population, population growth, and the urbanisation rate as instruments. In Hwang (2002), corruption is instrumented with three variables: the percent of population professing Protestant faith, a dummy for being a former British colony, and an index of ethnolinguistic fragmentation. Attila et al. (2009) favour ethnolinguistic fragmentation, legal origins (French and British), distance from the equator, and the urbanisation rate as instruments. Thornton (2008) uses openness, the black-market exchange rate premium, ethnic fragmentation, and a dummy for oil producers instead. In this study, we follow Hwang (2002), Attila et al. (2009), and Thornton (2008) by using the ethnolinguistic fragmentation index (Taylor & Hudson, 1972), and adding an index capturing religious fragmentation (Mauro, 1995), both employing the argument that more fragmented countries tend to have more dishonest bureaucracies.

An additional challenge is the possibility that some omitted variables may be correlated with both corruption and tax collection. To mitigate the omitted variable bias, the literature has used the within fixed effects estimator to control for country-specific factors. However, this technique expunges the heterogeneity in the corruption variable and the instrument variables, which exhibit significant country-specific components (see Appendix 1). Accounting for both endogeneity and fixed effects would have been preferable, but the lack of idiosyncratic heterogeneity in the corruption index led to weak results.

For the reasons mentioned above, we apply pooled instrumental variable (IV) estimations. Pooled methods do not control for fixed effects and assume that the unobserved heterogeneity is uncorrelated with the covariates. This approach helps prevent the collinearity bias between the corruption indexes, the IV variables, and the country fixed effects. All estimates correct for autocorrelation and heteroscedasticity. Given the estimation weaknesses, the below results should be interpreted as controlled correlations, rather than clear causation of corruption to revenue.

5.2 Results

5.2.1 Baseline specifications

The pooled IV results are reported in Table 2, columns (1) and (2), and the corresponding first-stage results are discussed in Appendix 2. In line with the existing literature, the relationship between corruption and tax revenue in per cent of GDP is

[10] This data is obtained from the World Bank Development Indicators covering the years 1995 to 2014.

negative and significant. The estimated coefficients are significant at least at the 5 per cent level, indicating that an increase of one standard deviation (SD) in corruption perception ―which corresponds to a differential between relatively highly corrupt and relatively less corrupt countries[11]― would correspond to an on average 12 percentage point lower tax revenue-to-GDP ratio.

Most control variables have the expected signs, comparable to the findings in Sen Gupta (2007). The coefficient associated with openness is positive, but only significant when the advanced economies dummy is added in the baseline specifications. Inflation has a positive impact on the tax-to-GDP ratio (inflation, when unanticipated, increases tax revenue). The increase in nominal income pushes people into higher tax brackets. There is a negative and significant relationship between the share of agriculture and revenue performance in the baseline specification. This confirms that the agricultural sector may be difficult to tax, especially if it is dominated by subsistence farmers. The coefficient associated with the log of per capita GDP is positive and significant in the baseline specification. This is in line with other studies that have found that the capacity to collect and pay taxes increases with the level of development. The effect of the log of per capita GDP on tax revenue is non-linear because the coefficient associated with the squared term is negative and significant.

We use the generalised method of moments (GMM) estimator to test for robustness of our results. Unfortunately, GMM does not lead to consistent estimates with our dataset. The number of instruments outweigh the cross-sectional dimension, and the model is over-identified, with the probability for the Sargan-Hansen test being well above the accepted thresholds in the literature.[12] In summary, our baseline estimates confirm the evidence that corruption undermines tax collection.

5.2.2 Advanced economies versus developing economies

We further check whether the negative relationship between corruption and tax revenue varies between advanced and developing economies (the latter including both low-income and emerging markets). We introduce additively and multiplicatively (with the corruption index) a dummy variable taking the value of 1 if the country is an advanced economy, and 0 otherwise. The results are shown in Table 2, columns (3) and (4). The adverse effect of corruption on tax collection is larger in advanced economies relative to the average impact for all countries in the sample. The coefficients associated with corruption are negative, and statistically significant at the 1 per cent level. The coefficients of the interactive terms are significantly negative. This result is a novelty to the existing literature and implies that any given change in the level of corruption is more detrimental in advanced economies, likely because of the lower overall level of corruption in these countries.

[11] For example, the average Corruption Perception Index is 26.3 for advanced, 62.5 for emerging, and 74 for low income economies.

[12] After following Roodman's (2009) strategy, we found that the probability of the Hansen J-statistic test equals 1 in most cases. The issue is even more pronounced when examining various tax categories.

Table 2: The Effect of Corruption on Tax Revenue

VARIABLES	IV (All Countries)		IV Advanced Economies (AEs)	
TI Corruption Perception Index (CPI)	**-0.1246*** (0.000)**		**-0.2175*** (0.023)**	
World Bank Control of Corruption Index (CCI)		**-0.1218*** (0.009)**		**-0.1664*** (0.022)**
CPI*AEs Dummy			**-0.7051*** (-0.203)**	
CCI*AEs Dummy				**-0.1921*** (0.072)**
AE Dummy			**1.2848*** (0.411)**	**0.2395** (0.109)**
Trade Openness	-0.0010	0.0014	0.0257**	0.0144**
	(0.005)	(0.005)	(0.010)	(0.007)
Inflation	0.0163***	0.0156***	0.0054	0.0084**
	(0.003)	(0.003)	(0.006)	(0.004)
Share of Agriculture	-0.1548***	-0.1035***	0.2041*	0.1021
	(0.034)	(0.033)	(0.107)	(0.076)
PPPPC	0.3398***	0.3589***	-0.0009	0.1733*
	(0.033)	(0.032)	(0.141)	(0.089)
PPPPC^2	-0.0220***	-0.0226***	-0.0007	-0.0108*
	(0.002)	(0.002)	(0.009)	(0.006)
Constant	-0.7247***	-1.1921***	0.8267	-0.4796
	(0.121)	(0.134)	(0.544)	(0.350)
Observations	1,934	1,934	1,934	1,934
Cragg-Donald	94.50	106.3	3.877	2.536

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.2.3 Tax components

Next, we turn to the relationship between corruption and the components of tax revenue. We split overall tax revenue into personal and corporate income tax, social security, property tax, taxes on domestic goods and services, and international trade taxes. This approach should help understand how the adverse effects of corruption impact specific taxes and avoid misleading conclusions that can arise from broad aggregates, especially if tax components move in offsetting directions. We re-estimate equation (1) for each tax item using the pooled IV methodology described above.

The results are shown in Table 3, where all taxes are specified as a ratio to GDP. The personal income tax (PIT), VAT, social security contributions, and trade taxes all confirm the negative relationship with corruption. The associated coefficients are negative and statistically significant at the 1 per cent level.

The negative relationship with PIT suggests that corruption works through informality, which favours tax evasion. An increase of one SD in corruption perception or control of corruption would decrease the PIT ratio by 0.2 percentage points per year. The impact of corruption on goods and services is felt most strongly via its impact on the VAT—the tax with most revenue potential. An increase of one SD in corruption perception would decrease the VAT ratio by 0.2 percentage points per year. Excise taxes tend to be unaffected. Social security contributions (SSCs), on the other hand, correlate strongly with the perception of corruption—an increase of one SD in corruption would decrease SSCs by 0.5 percentage points per year. International trade tax revenue would decrease by 0.2 percentage points per year. While the importance of international trade taxes is declining for many developing countries, they remain a crucial source of revenue in fragile states.

Surprisingly, the relationship between corruption and corporate income tax (CIT) is positive. An increase of one SD in corruption perception is associated with an increase in the CIT ratio by 0.1 percentage points per year. Given the deterrent effect of corruption on taxes prone to informality, there seems to be a substitution in favour of the tax burden on the formal sector. Finally, we do not find any impact on property taxes, which typically have a relatively small share in overall revenue. Furthermore, property taxes are usually levied at the subnational level where compliance may be weak, particularly in developing countries. The results remain broadly robust to the use of an alternative ICTD database (see Appendix 3).

Table 3: The Effect of Corruption on Tax Revenue Components

	Corruption Index	Tax Type	**Coefficeint**	**Significance**	Observations	Cragg-Donald
WoRLD data	Transparency International Corruption Perception Index	Total Income	**-0.0227*** **	**(0.000)**	1,562	43.30
		Individual Income	**-0.0363*** **	**(0.000)**	1,309	22.68
		Corporate Income	**0.0136*** **	**(0.000)**	1,388	34.55
		Tax on Trade	**-0.0408*** **	**(0.000)**	1,347	44.17
		Tax on Goods and Services	**-0.0272*** **	**(0.000)**	1,531	43.05
		Excise Tax	**-0.0045**	**(0.000)**	1,451	40.45
		VAT	**-0.0340*** **	**(0.000)**	1,310	38.14
		Property Tax	**-0.0023**	**(0.000)**	1,388	37.62
		Social Security Contributions	**-0.0997*** **	**(0.023)**	1,076	23.23
	World Bank Control of Corruption Index	Total Income	**-0.0236*** **	**(0.005)**	1,562	47.84
		Individual Income	**-0.0386*** **	**(0.006)**	1,309	27.18
		Corporate Income	**0.0143*** **	**(0.004)**	1,388	40.35
		Tax on Trade	**-0.0384*** **	**(0.010)**	1,347	46.11
		Tax on Goods and Services	**-0.0319*** **	**(0.004)**	1,531	45.79
		Excise Tax	**-0.0097*** **	**(0.003)**	1,451	39.33
		VAT	**-0.0373*** **	**(0.004)**	1,310	40.22
		Property Tax	**-0.0016**	**(0.002)**	1,388	39.87
		Social Security Contributions	**-0.1049*** **	**(0.014)**	1,076	23.44

Notes: Robust standard errors in parentheses, *** significance at the 1 per cent level, ** significance at the 5 per cent level, * significance at the 10 per cent level.

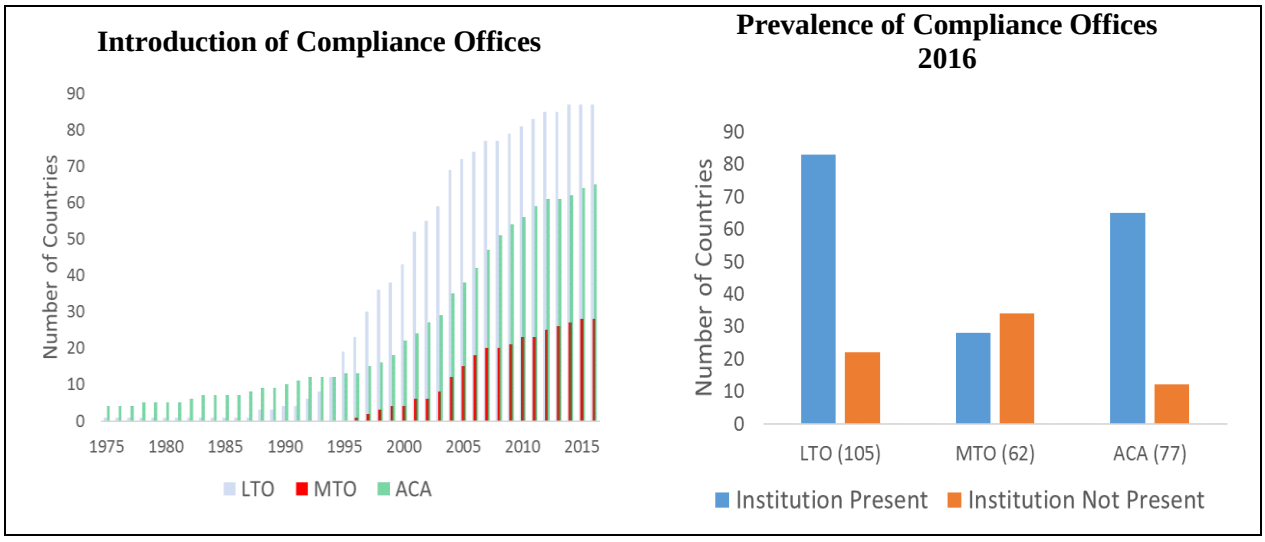
6. IMPROVING COMPLIANCE – THE IMPACT OF INSTITUTIONS

In this section, we analyse the impact of specific public institutions—such as LTOs—on compliance. These institutions are expected to have a dampening effect on corruption and a positive influence on tax revenue. We collect dates of establishment

on LTOs, MTOs and ACAs, which are detailed in Appendix 4. The resulting database on LTOs and MTOs is the largest of its kind, and will be useful for future impact analysis of fiscal and public institutions on economic performance.

The first wave of establishment of LTOs can be observed during the mid- to late 1990s, and currently only a minority of countries have not opted to establish them.

Figure 5: Effectiveness of Compliance Offices



Notes: chart only shows observations for which date of establishment could be identified, or where it is certain that institutions do not exist.

6.1 Propensity score matching technique

The dates of establishment of taxpayer offices or ACAs are the foundation of the propensity-score matching (PSM) methodology developed by Rosenbaum and Rubin (1983), which is applied here to analyse the impact of these institutions on corruption and tax revenues. PSM is a statistical matching technique that attempts to estimate the effect of a treatment, policy, or other intervention by accounting for the covariates that predict receiving the treatment. In our case, the treatment is the establishment of a specific institution (LTO, MTO, or ACA) to counter corruption and improve revenue performance. Ebeke et al. (2016) applied this methodology to study the impact of LTOs, VAT and semi-autonomous revenue authorities on tax revenue in 41 sub-Saharan African countries, an approach that is applied here in a difference-in-difference specification.

The reason for using difference-in-difference methodology *vis-à-vis* panel estimation is that it is difficult to control for endogeneity and the resulting bias in the latter approach. The bias arises because the apparent difference in outcomes between countries with and without units may depend on characteristics that determine whether a unit was established in the first place, and therefore the outcome could be dependent on these characteristics rather than on the establishment (treatment) per se. Given the absence of suitable instruments to capture the institution's establishment, we refrain from using standard panel estimation. PSM avoids the common endogeneity issue by using explanatory variables to find observations across countries when they were equally likely to establish the respective institution, by means of propensity scores.

The impact of an institution on the dependent variable is then compared across countries with similar propensity scores.

Propensity scores are estimated with a Probit model, using a set of independent variables that are close to those in the previous section 5.1 model – a dummy variable for the state of development, the share of agriculture, real per capita GDP, openness, and population – as well as a variable for time. Both the general income category (AE, EM or LIDC), as well as the income level within these groups impacts the likelihood of establishment of institutions, specifically LTOs and ACAs. For example, many of the poorest LIDCs share the characteristic of below-average LIDC tax ratios and higher levels of perceived corruption. All controls, except for population, are significant in explaining the likelihood of establishment of these institutions. In an expanded baseline, we add CPI inflation, latitude, a dummy variable for oil exporters, total tax revenue as a share to GDP, and the ratio of external debt to GDP. The latter two controls in particular are likely to influence decisions to increase efforts to mobilise revenue or reduce corruption for economic and fiscal stabilisation purposes.

Once the propensity scores are estimated, the observations are matched with three different matching estimators – Stratification, Kernel, and local linear regression matching. We enforce common support for the estimation, i.e., treatment observations with propensity scores higher *r* than the highest *t* propensity score in the non-treated pool are left unmatched.[13]

The average treatment effect (ATE) – the impact from the establishment of the units on variables of interest, compared to countries without the units – is analysed based on the identified matches. We use a difference-in-difference approach specified as follows:

$$\begin{aligned} ATE &= E(\Delta_{t+x} - \Delta_{t-x} \mid T=1) = E((Y_{t+x}^{T=1} - Y_{t+x}^{T=0}) - (Y_{t-x}^{T=1} - Y_{t-x}^{T=0}) \mid T=1 \\ &= E(Y_{t+x}^{T=1} - Y_{t-x}^{T=1} \mid T=1) - (Y_{t+x}^{T=0} - Y_{t-x}^{T=0} \mid T=1) \end{aligned} \quad (2)$$

where $T = 1$ if an institution is established, and $T = 0$ otherwise. The first term on the lower right hand side refers to the differences in outcomes before (or at) and after the treatment for the treated group. The second term uses the differences in outcomes for the control group to eliminate the bias. This specification eliminates the bias arising from common time trends in the dependent variables. It further eliminates issues resulting from the likely case that countries without the respective institutions have a higher tax revenue ratio or higher corruption to begin with. For example, if we used the revenue ratio in absolute terms and not in difference levels as a dependent variable, the results would simply compare the revenue-to-GDP ratios between countries with and without institutions. If countries that establish the institutions have lower tax ratios on average, the ATE will suggest that LTOs lead to lower tax revenue mobilisation. Instead, taking the difference-in-difference approach changes the interpretation of the ATE to 'how much did the tax revenue ratio increase after the establishment of an LTO compared to countries that have not done so'.

[13] The distributions of the propensity scores for treated and control groups are visually inspected with kernel density plots for each of the presented estimates, which are almost identical to one another after matching for all presented results below.

6.2 Results

The PSM baseline results are shown in Table 4, with the dependent variables specified as follows: (i) for corruption we use the change in the Corruption Perception Index three years after and one year before establishment of an institution; (ii) for revenue the difference between tax revenue two years after and the year of establishment is used.[14] In the baseline, treatment (establishment) is noted as one occurrence only, and all years after the establishment year are dropped. All years before establishment are kept, except for three (for corruption) or two (for revenue) years before the year of establishment to avoid an overlap in the dependent variable.

Column 1 of Table 4 shows that LTOs have a statistically significant impact on the perception of corruption (significance levels are based on the bootstrap *T*-statistics).[15] This impact is negative, with an average treatment effect (ATE) of about -3; i.e., the perception of corruption significantly declines (or increases significantly less) during the three years after the establishment of the LTO compared to other countries. On the other hand, the impact of both anti-corruption units and MTOs on the Corruption Perception Index is insignificant. For ACAs, the result is in line with the notion that the establishment of anti-corruption units alone is likely to be insufficient to lower corruption, unless they are given wide-ranging independence and power to pursue relevant cases. It further provides empirical support to those who have argued that ACAs are a mere additional bureaucratic step in a corrupt environment that is used to support corrupt activities (for example, bribes to avoid prosecution).

Table 4 further shows a statistically significant and positive impact of the establishment of LTOs on tax revenue, with an average treatment effect of about 0.6 per cent of GDP: i.e., following the establishment of an LTO, tax revenue increases on average by 0.6 per cent of GDP more (or declines less) over two years compared to countries that have not established an LTO. At the same time, the impact of the establishment of MTOs and ACAs, while positive, is insignificant. These results suggest that the establishment of LTOs has led to improvements in how compliance of this key segment is managed – via targeted taxpayer service and improved enforcement programs. This may not be the case with respect to MTOs. The establishment of MTOs is a relatively new concept, and while offices have been set up in several countries, tailored compliance programs for this segment have, on average, not yet been implemented to the same degree as for LTOs. In addition, MTOs are often regionally organised and managed, with decentralisation making targeted program implementation and supervision more challenging.[16]

[14] The impact on corruption perception is likely to be realised with delay. However, where signal effects are strong, perception might change in the year of establishment itself. In contrast, the effects of LTOs on revenue are unlikely to be realised in the first year of establishment, given a natural learning process. However, the results hold for the LTO impact on tax revenue also if tax revenue is specified like the Corruption Perception Index.

[15] The Kernel and log-linear regression methods estimate the propensity scores after excluding all observations for which the dependent variable is not available (using the psmatch2 command in Stata). The stratification method first estimates the propensity scores, and in a separate step estimates the ATE (using the pscore command in Stata). Consequently, the treatment observations are different across these methods.

[16] A third argument is that shareholders of larger corporates have an interest in a no-corruption policy in the companies they are invested in, while smaller taxpayers and firms often directly interact with the tax authorities.

Table 4: Impact of Institutions on Corruption and Tax Revenue – Baseline

Dependent Variable	Corruption Perception Index: (T+3) - (T-1)			Tax Revenue Change: (T+2) - T		
Treatment Variable	**LTO**	**MTO**	**ACA**	**LTO**	**MTO**	**ACA**
Control Variables	State of development, share of agriculture, real per capita GDP, openess, population, year					
Kernel Method						
Observations Treatment Group	32	12	41	52	20	33
Observations Control Group	286	432	534	492	601	534
ATE	**-2.87****	**0.53**	**-0.94**	**0.006****	**0.000**	**0.001**
T-Statistic	-2.77	0.3	-0.88	2.29	0.11	0.45
Bootstrap T-Statistic	-2.49	0.25	-1.05	2.38	0.1	0.42
Log linear regression matching						
Observations Treatment Group	32	12	41	52	20	33
Observations Control Group	286	432	534	492	601	451
ATE	**-2.77*****	**0.45**	**-0.78**	**0.006****	**0**	**0.002**
T-Statistic	-1.97	0.2	-0.51	1.65	0.10	0.42
Bootstrap T-Statistic	-2.63	0.26	-0.67	2.02	0.18	0.52
Stratification Method						
Observations Treatment Group	61	23	41	61	23	41
Observations Control Group	1467	1900	2096	1467	1900	2096
ATE	**-3.07*****	**0.448**	**-0.709**	**0.007****	**0.001**	**0.002**
T-Statistic	-4.116	0.358	-0.818	2.79	0.24	0.53
Bootstrap T-Statistic	-2.899	0.338	-0.787	2.35	0.21	0.48

Notes: IMF estimates, *** significance at the 1 per cent level, ** significance at the 5 per cent level, * significance at the 10 per cent level.

The impact of LTOs on revenue and corruption might seem contrary to the notion that increased perception of corruption has a positive impact on CIT revenues. However, the cross-country regression describes a structural comparison of how revenue levels and revenue structure compare at different levels of perceived corruption. On average, countries with higher perceived corruption have higher CIT revenues. The establishment of LTOs could lead to a shorter-term reduction in the level of perceived corruption, as well as to an increase in CIT and other tax revenue, without altering this structural comparison.

Since the treatment effects of MTOs and ACAs on corruption and tax revenue remain largely insignificant for the remainder of specifications below, results for them are not shown.

Table 5: Impact of LTOs on Tax Revenue – Robustness

Dependent Variable	Corruption Perception Index: (T+3) - (T-1)			Tax Revenue Change: (T+2) - T		
Robustness Test	**Expanded Baseline**	**No Fragile States**	**Full Sample**	**Expanded Baseline**	**No Fragile States**	**Full Sample**
Treatment Variable	LTO	LTO	LTO	LTO	LTO	LTO
Control Variables	Baseline + CPI inflation, latitude, dummy for oil exporters, total tax revenue as a share to GDP, the ratio of external debt to GDP	Baseline	Baseline	Baseline + CPI inflation, latitude, dummy for oil exporters, total tax revenue as a share to GDP, the ratio of external debt to GDP	Baseline	Baseline
Kernel Method						
Observations Treatment Group	28	29	384	46	41	528
Observations Control Group	208	286	259	339	455	448
ATE	**-2.1***	**-3.33*****	**-2.35*****	**0.007*****	**0.006****	**0.004****
T-Statistic	-1.72	-3.06	-3.10	1.95	2.00	1.56
Bootstrap T-Statistic	-1.66	-2.72	-4.3	2.93	1.93	2.15
Log linear regression matching						
Observations Treatment Group	28	29	384	40	41	528
Observations Control Group	208	286	259	414	455	448
ATE	**-2.13****	**-3.32*****	**-2.25*****	**0.004**	**0.005***	**0.004****
T-Statistic	-1.550	-2.700	-2.650	1.010	1.360	1.510
Bootstrap T-Statistic	-2.01	-3.39	-3.24	1.46	1.89	2.28
Stratification Method						
Observations Treatment Group	57	51	840	46	51	840
Observations Control Group	1157	1797	1681	967	1797	1681
ATE	**-2.61****	**-3.16*****	**-1.66*****	**0.007****	**0.005***	**0.004**
T-Statistic	-3.287	-4.11	-5.215	2.654	2.12	1.85
Bootstrap T-Statistic	-2.305	-3.201	-2.645	2.518	1.659	1.135

Notes: IMF estimates, *** significance at the 1 per cent level, ** significance at the 5 per cent level, * significance at the 10 per cent level.

We conduct several robustness tests in Table 5. First, we expand the set of independent variables to include CPI inflation, a control for latitude, a dummy variable for oil exporters, total tax revenue as a share to GDP, and the ratio of external debt to GDP. The second specification deletes all fragile states from the baseline estimation on the assumption that their institutions are weaker than other countries. Finally, and with fragile states included, the last test refrains from dropping the observations after an institution is established, increasing the number of observations with an LTO in place significantly. The results are consistent across all specifications. The perception of corruption declines and revenue increases significantly when fragile states are excluded, and the results seem to hold for the entire sample, suggesting that after LTOs are established, revenue continues to increase faster than in countries without LTOs.[17]

[17] Ideally, we would like to disaggregate the revenue data into its components, and analyse the institutions' impact by level of development. Unfortunately, these analyses lead to a significant loss of observations in the treatment group, rendering this analysis infeasible.

7. POLICY CONCLUSIONS

This article revisits the relationship between perceived corruption and taxation, by using a recently available revenue dataset. It finds that corruption has a considerable impact on aggregate revenue performance— with a loss of revenue of as much as 0.6 per cent of GDP annually. The effect is felt even on taxes with most revenue potential, such as the VAT. Taxes on income and international trade as well as social security contributions are equally adversely affected. It seems that the effect of corruption on revenue performance is mediated through poor compliance as suggested by a strong correlation between VAT compliance and perceived corruption. Corruption takes a toll on the functioning of the VAT; the higher the perceived corruption, the slower the speed at which VAT refunds are given.

The article further examines the effect of institutions designed to reduce corruption and improve tax compliance. In this regard, it assesses the impact of over 100 LTOs, MTOs and ACAs across different country groups and regions. It finds that LTOs do indeed reduce perceived corruption. They further seem to enhance revenue performance, with countries with LTOs outperforming revenue generation of countries without LTOs by as much as 0.6 per cent of GDP. The effect of MTOs and ACAs on corruption and revenue performance is not statistically significant.

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9. APPENDICES

9.1 Appendix 1

Table 1: Variance Decomposition of Corruption, Instruments, and Tax Revenues-to-GDP

Variables	Fraction of variance due to country fixed effects in %
Corruption Index	
TI Perception Index	95.77
WB Control of Corruption	97.47
Instruments	
Ethnolinguistic fragmentation	100.00
Religion Fragmentation	100.00
Tax Revenue	
WoRLD	93.99
ICTD	95.27

Notes: Values show the percentage of the variable that is explained by country fixed effects.

9.2 Appendix 2

All instruments are highly significant in explaining the corruption index. Ethnolinguistic fragmentation has a positive and significant impact on corruption, whereas religious fragmentation has a negative and significant effect. The partial R2 of the excluded instruments is between 0.26 and 0.28. Moreover, the *F*-statistics of the first stage are significant at 1 per cent.

Table: First Stage

Variables*	**TI Perception Index**	**WB Control of Corruption**
Ethnolinguistic Fragmentation	**18.3044*** **	**0.9831*** **
	(1.421)	**(0.070)**
Religion Fragmentation	**-9.8781*** **	**-0.4166*** **
	(1.320)	**(0.063)**
Observations	1,934	1,934
R-squared	0.672	0.663
Partial R-squared	0.262	0.275
F(2, 1931) = 424.40		
Prob > F= 0.0000		

*Controls included

Robust standard errors in parentheses

***p<0.01, **p<0.05, *p<0.1

9.3 Appendix 3:

Table: Results with ICTD Data

	Corruption Index	Tax Type	Coefficeint	Significance	Observations	Cragg-Donald
ICTD Data	Transparency International Corruption Perception Index	Total Income	**-0.0249*** **	**(0.000)**	981	43.45
		Individual Income	**-0.0136**	**(0.000)**	913	16.98
		Corporate Income	**0.0023**	**(0.000)**	866	18.92
		Tax on Trade	**-0.0272*** **	**(0.000)**	1,033	42.65
		Tax on Goods and Services	**-0.0363*** **	**(0.000)**	1,065	29.82
		Excise Tax	**-0.0045***	**(0.000)**	981	26.64
		Indirect Taxes	**-0.0748*** **	**(0.023)**	1,031	38.83
		Direct Taxes	**-0.0385*** **	**(0.000)**	1,036	40.97
		Property Tax	**-0.0045** **	**(0.000)**	944	26.94
		Social Security Contributions	**-0.0612*** **	**(0.023)**	1,014	30.14
	World Bank Control of Corruption Index	Total Income	**-0.0259*** **	**(0.005)**	981	49.61
		Individual Income	**-0.0182** **	**(0.009)**	913	18.12
		Corporate Income	**0.0065**	**(0.004)**	866	20.48
		Tax on Trade	**-0.0273*** **	**(0.010)**	1,033	52.41
		Tax on Goods and Services	**-0.0520*** **	**(0.008)**	1,065	32.25
		Excise Tax	**-0.0126*** **	**(0.003)**	981	31.63
		Indirect Taxes	**-0.0886*** **	**(0.011)**	1,031	45.02
		Direct Taxes	**-0.0390*** **	**(0.006)**	1,036	47.34
		Property Tax	**-0.0029**	**(0.002)**	944	31.87
		Social Security Contributions	**-0.0583*** **	**(0.011)**	1,014	37.84

9.4 Appendix 4:

Table: LTO, MTO and ACA Establishment Dates

Country	LTO	Since	MTO	Since	Anti-Corruption Agency	Since
Afghanistan	Y	2005	Y	2010	Y	2008
Albania	Y	1998	N		N	
Algeria	Y	2001				
Anguilla	N					
Antigua and Barbuda	N					
Argentina	Y	1997	Y	1997	Y	1999
Armenia	Y	2002	N		Y	2004
Austria					Y	2010
Australia	Y	1994				
Azerbaijan	Y	2003			Y	2005
Bangladesh	Y	2003	N		Y	2004
Barbados	N		N		N	
Belarus	N		N		Y	1991
Benin	Y	1995	Y	1996	Y	2008
Bhutan					Y	2005
Bolivia	Y	1988				
Bosnia and Herzegovina	Y	2004	N		Y	2009
Botswana	Y	2012				

Country	LTO	Since	MTO	Since	Anti-Corruption Agency	Since
Brazil	Y	2010	N		N	
Bulgaria	Y	1997	N		N	
Burkina Faso	Y	2004	Y	2004	Y	2007
Burundi	Y	2003	Y	2009	N	
Cambodia	Y	1995				
Cameroon	Y	2004	Y	2006	Y	2000
Central African Republic	Y	1998	Y	1998		
Chad	Y	1997	N			
China	N		N		Y	1978
Colombia	Y	1988				
Comoros	Y	1994				
Congo, Republic of	Y	1997				
Cook Islands	N					
Côte d'Ivoire	Y	1997	Y	2014	Y	2015
Croatia	Y	2005	N		Y	2001
Cyprus	Y	2014	N		Y	2003
Djibouti	Y	2001	Y	2001		
Dominica	N					
Congo, Democratic Republic of the	Y	2003	Y	2005		
Ecuador	Y	1994	N		Y	2007
Estonia	N					
Ethiopia	Y	2001			Y	2001
Fiji	N					
Gabon	Y	2007				
Georgia	Y (a)	1996	N		Y	2012
Ghana	Y	2009	Y	2013	Y	1992
Greece	Y	2011	N		Y	2011
Grenada	N					
Guatemala	Y	2007	N		N	
Guinea	Y	1996	Y	2001	Y	2016
Guinea-Bissau	Y	2004	Y	2004	Y	1995
Haiti	Y	1996	Y	2012	Y	2004
Honduras	Y	2004			Y	1928
Hong Kong SAR	N					
Hungary	Y	1996				
Iceland	N					
India					Y	1964

Country	LTO	Since	MTO	Since	Anti-Corruption Agency	Since
Indonesia	Y	2002	Y	2006	Y	2002
Iraq	N (b)		N		Y	2004
Iran	Y	2001				
Jamaica	Y	2009	N		Y	2000
Jordan	Y	2004	Y	2004	Y	2006
Kenya	Y (c)	2006	N		Y	1997
Kenya	Y (c)	1998				
Korea	N				Y	2008
Kosovo	Y	2001	N		Y	2007
Lao PDR	Y	1998				
Latvia	Y	1995			Y	2003
Lebanon	Y	2005	N		N	
Liberia					Y	2008
Lithuania					Y	1997
Luxembourg	N					
Madagascar	Y	1997	Y	2003	Y	2004
Malawi	Y	2007	N		Y	1998
Malaysia					Y	2009
Mali	Y	1997			N	
Malta	N					
Mauritania	Y	2000	Y	2007		
Mauritius					Y	2002
Mexico	Y	1999	Y	1999	N	
Moldova	Y	2011	N		Y	2002
Mongolia	Y	2000	N		Y	2007
Morocco	Y	2000				
Myanmar	Y	2014	Y	2015	Y	2014
Namibia					Y	2006
Netherlands	Y	1990				
New Zealand	Y	1994			Y	1990
Nicaragua	Y	1993				
Niger	Y	1998	Y	2003		
Nigeria	N		N		Y	2000
Pakistan	Y	2004	N		Y	1999
Papua New Guinea	N				Y	2011
Paraguay	Y	1993				
Peru	Y	1992				
Philippines	Y	2000	N		Y	1987

Country	LTO	Since	MTO	Since	Anti-Corruption Agency	Since
Poland					Y	2006
Portugal	Y	2012	N		N	
Romania	Y	2004	Y	2007	Y	2005
Russia	Y	1998			Y	2011
Saint Lucia	N					
Saint Vincent and the Grenadines	N					
Senegal	Y	2001	Y	2012	Y	2004
Serbia	Y	2002	N		Y	2009
Sierra Leone					Y	2000
Singapore					Y	1952
Slovenia					Y	2010
Somalia	N		N		N	
South Africa	Y	2001				
Spain	Y	1995	N		Y	1982
Sri Lanka	Y	1995				
Sudan	Y	2004	Y	2005	Y	2012
Switzerland	N					
Tanzania	Y	2001	Y	2005	Y	1974
Togo	Y	1995	Y	2006		
Turkey	Y	2006	N		N	
Uganda	Y (d)	2004	Y	2009	Y	1988
Uganda	Y (d)	1999				
Ukraine	Y	2000	N		Y	2015
Uruguay	Y	1992				
United Kingdom					Y	1983
United States	Y	1975				
Venezuela	Y	1995				
Vietnam	Y	2010	N		Y	2006
Yemen	Y	2001	Y	2010	Y	2007

Notes: (a) Georgia - LTO dismantled in 2010; (b) Iraq - an LTO does exist, but it is staffed with 4 people only. We therefore classify it as not functional; (c) Kenya - two dates are presented, because LTO was formed as an operations unit in 1998 to provide one-stop shop services in the administration of income tax and VAT matters affecting large taxpayers. The LTO was developed into a fully-fledged department in the year 2006 with the sole purpose of administering domestic tax matters affecting large taxpayers. Both dates are kept due to a likely impact from both reforms; (d) Uganda - LTO closed in 2001 and re-opened in 2004.

9.5 Appendix 5:

Table: Summary Statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Total Tax - WoRLD	1934	19.06776	8.04348	0.70334	58.11479
Total Income Tax - WoRLD	1562	7.57159	5.18073	0.00253	33.195
Individual Income Tax - WoRLD	1309	4.89952	4.61933	0.001	27.674
Corporate Income Tax - WoRLD	1388	3.02241	2.41465	0.000555	25.50648
Trade Taxes - WoRLD	1347	1.96975	3.21967	0.001	39.90194
Excise Taxes - WoRLD	1451	2.29456	1.44299	0.00042	21.88961
Tax on goods and services - WoRLD	1531	6.09664	2.89537	0.00242	25.87794
VAT Tax - WoRLD	1310	6.17329	2.34868	1.34E-07	19.20702
Property Tax - WoRLD	1388	1.00759	1.01473	6.12E-07	7.299
Social Security Contribution - WoRLD	1076	6.59905	5.07973	4.42E-06	18.042
Corruption Perception Index - TI	1934	55.8348	22.65745	0	92
Control of Corruption - WB	1934	-0.1120269	1.082339	-2.59	1.64
PPP Per Capita	1934	9.104392	1.176914	6.097523	11.916
Share of Agricuture	1934	12.29981	11.88534	0.03447	58.20515
Inflation	1934	-3.195819	1.065253	-9.782633	1.178743
Ethnic Fragmentation	1934	0.4220083	0.2551487	0	0.9302
Religion Fragmentation	1934	0.4274414	0.2360986	0.0035	0.8603
Trade Openness	1934	84.9161	49.21485	15.58034	439.6567
Corruption Index - ICRG	1651	0.5241551	0.2138007	0	1
Compliance Gap % of GDP	109	2.798532	1.664916	0.38	6.88
C-Efficiency	1213	0.5020849	0.1863975	0.0611281	1.193815