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Tax Administration and Firm Performance: New Data and Evidence for Emerging Market and Developing Economies

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Abstract

Tax compliance costs tend to be disproportionately higher for small and young businesses. This paper examines how the quality of tax administration affects firm performance for a large sample of firms in emerging market and developing economies. We construct a novel, internationally comparable, and multidimensional index of tax administration quality (the *TAQI*) using information from the Tax Administration Diagnostic Assessment Tool. We show that better tax administration attenuates the productivity gap of small and young firms relative to larger and older firms, a result that is robust to controlling for other aspects of tax policy and of economic governance, alternative definitions of small and young firms, and measures of the quality of tax administration. From a policy perspective, we provide evidence that countries can reap growth and productivity dividends from improvements in tax administration that lower compliance costs faced by firms.

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"We must collect taxes without causing unnecessary burden to citizens. Just as a flower is not hurt when the bee draws nectar from it, so also should the king not disturb the taxpayer when he collects taxes."

Kautilya (c. 350-275 BCE), The *Arthashastra*

I. INTRODUCTION

Tax policy and administrative measures that mobilize revenues, reduce economic distortions, improve resource allocation, and lift productivity and growth prospects are widely seen as policy priorities for many countries (IMF, 2015, 2016). Recent studies have investigated the relationship between tax capacity and subsequent economic growth and development (Gaspar et al., 2016). Keen and Slemrod (2017) show how tax administrative interventions to improve compliance should be evaluated from a tax revenue perspective. In this paper, using novel data on tax administration quality, we focus on a different aspect of tax administration: the link between tax compliance costs—the burden associated with determining, documenting, and making payments to meet tax obligations and complying with post-filing procedures—and firm performance.

Tax compliance costs can add significantly to the tax burden that firms face and are separate from their direct financial tax liability. These costs can be particularly onerous for small and medium enterprises (SMEs) and young firms (Lignier and Evans, 2012; Venkatesh and Slemrod, 2002; Coolidge, 2012; IMF, 2015; World Bank, 2015). The reason is that they include substantial fixed components—filing a value added tax (VAT) return costs the same regardless of the amount remitted—that can be especially large for small businesses. Larger firms can also benefit from economies of scale due to specialization within firms. Similarly, post-filing procedures (e.g., claiming a VAT refund, undergoing a tax audit, or appealing a tax assessment) can be more challenging for small taxpayers and younger and less-experienced firms. To the extent that a high compliance burden diverts resources from productive activities (e.g., investment in physical capital, productivity-enhancing innovation) and increases input costs without creating additional output, firm productivity can decline.

At the same time, evidence suggests that SMEs and younger firms are generally less productive than larger and older firms. From a theoretical standpoint, the positive association between productivity and firm size arises due to sunk costs or learning (Melitz, 2003; Asplund and Nocke, 2006), suggesting that over time more productive firms expand at the expense of less productive ones. Empirical studies confirm a positive relationship between productivity and firm size at the industry level in both advanced and developing economies (Bartelsman et al., 2009; Ayyagari et al., 2011). Similarly, evidence on this life cycle of firms suggests that often older plants tend to be more productive than younger ones.[1]

[1] Hsieh and Klenow (2014) find that 35-year old plants were on average nine times more productive in the manufacturing sector in the US. Evidence from developing countries also suggests that new firms generally exhibit lower productivity growth than incumbents (Li and Rama, 2015).

These considerations warrant a more systematic examination of the relationship between compliance burdens created by tax administration and firm performance. However, cross-country empirical evidence on this link is scant given significant measurement issues. This is because existing measures of tax compliance costs reflect both the quality of tax administration and the complexity of tax policy. For instance, the amount of time required to file a tax return is also driven by the number and types of deductions allowed under the tax code. Moreover, compliance costs are multidimensional in nature, reflecting both the quality and availability of information on tax liabilities as well as modalities for making payments and appeals. This suggests that tax administration quality should be measured in a comparable and comprehensive way, but should abstract from tax policy considerations.

In this paper, we compile a novel Tax Administration Quality Index (TAQI) using country-specific information on different dimensions of tax administration pertinent for the tax compliance burden faced by firms.[2] The index draws upon the Tax Administration Diagnostic Assessment Tool (TADAT), which provides an evidence-based and scored assessment of key performance outcome areas that cover most tax administration functions, processes, and institutions. [3] In particular, our index captures efforts to improve the quality and flow of information to taxpayers, simplify the structure of the tax system, and streamline reporting requirements and procedures along different dimensions. This country-level index is related to firm-level data from the World Bank Enterprise Surveys for 21 emerging market and developing countries.

Consistent with the widely accepted evidence that tax compliance costs tend to be disproportionately higher for small and young businesses, our paper focuses on the differential impact of tax administration quality on productivity across firms of different size and age. In particular, our empirical strategy relies on a difference-in-difference approach. Given the regressive nature of tax compliance costs, the identifying assumption is that small and young firms are likely to benefit more than larger and more mature firms from administrations that alleviate tax compliance burdens. While reverse causality is attenuated by using firm-level data, our approach also enables us to address potential omitted variable bias that may arise as a host of country characteristics matter for firm performance and can be correlated with high compliance burdens and poor quality tax administration.

The results of our empirical analysis strongly support the presence of productivity gains from efforts to strengthen tax administration, even after controlling for unobserved industry and country heterogeneity. In particular, we find a positive and *statistically significant* effect of a lower compliance burden (i.e., a high TAQI score) on the productivity of small and young firms. This result is robust to using alternative measures of firm productivity, controlling for various aspects of tax policy and economic governance that could have heterogeneous effects across firms, and using alternative

[2] The construction of the index on the strength of tax administration is similar to indices of other fiscal institutions and processes including budget institutions (Dabla-Norris et al., 2010) and public investment efficiency (Dabla-Norris et al., 2011)

[3] See http://www.tadat.org/ for details.

definitions of small and young firms. Our results are also robust to controlling for the propensity of firms to remain below a specific size threshold in a particular country (and sector) to avoid being monitored by tax authorities. Using the electronic filing rate from the Revenue Administration Fiscal Information Tool (RA-FIT) database that relates to one particular sub-component of the TAQI, we show that the estimated effects are also robust to changes in country coverage.[4] These effects are also *economically significant*. We find that the magnitude of productivity gains from plausible improvements in tax administration quality can partially offset the productivity disadvantage for small and young firms.

Our paper is related to various strands of literature that link tax and other administrative burdens with firm performance. An onerous burden to comply with taxes is associated with tax evasion, more corruption, less investment, and lower firm entry (Dabla-Norris et al., 2008; Djankov et al, 2010; Braunerhjelm and Eklund, 2014). For instance, Braunerhjelm and Eklund (2014) find that a 10 percent reduction in the tax administrative burden—as measured by the number of tax payments per year and the time required to pay taxes—leads to a 3 percent increase in annual business entry rates.

Measures compiled by the World Bank Doing Business Indicators, such as the time taken to file and pay taxes or the number of payments required per year, however, reflect both tax administration quality and the complexity of tax policy. This, in turn, renders isolating the distinct effects of improvements in tax administration on firm performance challenging.[5] Other studies relate firm performance to firm-level perceptions of the quality of tax administration (Aterido and Hallward-Driemeier, 2010) but are subject to significant endogeneity concerns. Our index captures tax administration functions, processes, and institutions at the country-level that are exogenous to the performance of the individual firm, thus attenuating problems of reverse causality. Moreover, the quantitative responses captured by our index link directly to objective, actionable tax administrative interventions.

Our paper is also related to recent studies that examine the effects of tax administration interventions on firm behavior in individual countries by exploiting differences in filing requirements or monitoring across firms of different sizes (see Kleven, 2016, for a discussion). Asatryan and Peichl (2016) exploit differences in filing frequency requirements across firms of different sizes in Armenia and find that there is bunching of firms below the threshold that requires firms to file monthly instead of quarterly. They show that the increase in tax compliance costs due to higher filing frequency results in firms both underreporting and reducing sales to avoid crossing the threshold. Similarly, Almunia and Lopez-Rodriguez (2015) using evidence from Spain show that firms bunch below a threshold for increased monitoring effort by tax authorities.[6]

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[4] See http://data.rafit.org for details.

[5] Using cost of collection indicators that express tax revenue in terms of the overall cost of tax administration is in principle subject to the same criticism.

[6] Another strand of the literature examines optimal tax enforcement (see Keen and Slemrod, 2017; and Creedy, 2016). Related to this, several empirical papers examine the effects particular types of tax administrative intervention related to enforcement on tax compliance (see Brockmeyer et al., 2016, for a brief survey).

The rest of the paper is organized as follows. Section II describes the compilation of the index of tax administration quality. Section III discusses the data sources and presents stylized facts. Section IV describes and discusses the empirical results. Section V concludes.

II. Measuring the Strength of Tax Administration

A. Overview

In this section, we describe the construction of the TAQI based on the TADAT framework (see following section for details on TADAT). The index aims to systematize available information regarding the desirable characteristics and functioning of tax administration across different areas relevant for the compliance burden faced by firms.

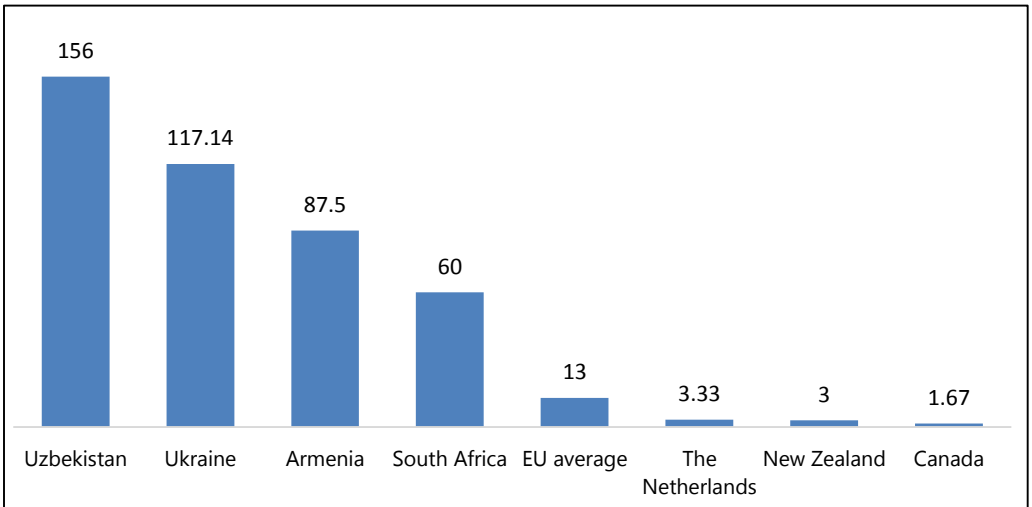
Tax compliance costs depend on a wide range of factors, including the complexity of tax policy, the characteristics of the tax base, structure of tax rates, the frequency of reform, and organization and efficiency of the tax authority (Evans, 2003; Bird, 2010). Country experiences suggest that clear and simple rules and administration systems that provide accurate information about tax liabilities can encourage compliance. The tax compliance burden on firms tends to be higher the more time is required to understand how to comply, or if the mechanics of fulfilling obligations is onerous. The TAQI attempts to capture these various dimensions of tax administration that are relevant for compliance costs, and hence for firm performance.

Studies of tax compliance costs carried out in many countries show that micro enterprises and SMEs typically bear much higher compliance costs in comparison with large businesses (Figure 1).[7] For example, in Ukraine, compliance costs for SMEs are 117 percent higher relative to sales than in large firms. More broadly, Figure 1 suggests that the disparity between the compliance costs faced by SMEs versus large enterprises can be significant in countries where the quality of tax administration is weaker.

Learning about tax laws constitutes an important element of tax compliance costs. Studies find that learning about tax issues represents between 5-10 percent of total tax compliance costs (Evans et al., 1997; Evans et al., 2013). While this amount may appear small, it is important to note that these estimates do not reflect cases where firms avoid learning about tax issues by hiring external tax advisers. Indeed, the combined share of learning and dealing with external tax advisers is estimated to range between 17-25 percent of all compliance costs in advanced economies (Lignier and Evans, 2012). These costs are presumably higher in developing countries and for younger firms given less accumulated experience in complying with taxes. Our index captures this aspect by examining both the quality and availability of information on tax liabilities as well as modalities for making payments and appeals.

[7] Similar relationships obtain between compliance costs and other measures of size, such as assets or employment.

Figure 1. Tax Compliance Burden as a Proportion of Sales - SMEs Relative to Large Firms



Notes: Data from different years; definition of SMEs differs across countries.
Sources: Sandford and Hasseldine (1992), Evans and Tran-Nam (2014), Allers (1994), European Commission (2004), Wurts (1995), World Bank Group (2007, 2009, 2010).

B. Composition of the Index

Consistent with internationally-recognized frameworks to assess the efficacy of tax administrations, we identify four distinct performance outcome areas of tax administration that are likely to matter for tax compliance costs faced by firms. These comprise 33 dimensions grouped into four broad categories: (i) supporting taxpayer information; (ii) filing and payment; (iii) post-filing processes; and (iv) accountability and transparency on the part of the tax authorities. Box 1 provides a summary of the main dimensions and components, while Appendix 1 provides a detailed description of the scoring methodology.

(1) Supporting Taxpayer Information

Advice and assistance available to facilitate business access to information on how to comply with taxes can play a crucial role in bridging knowledge gaps and lowering compliance costs, particularly for SMEs and young firms. Our index captures this along a number of dimensions, including the availability of accurate, current and understandable information and support on which taxpayers can rely in order to meet their obligations and claim their entitlements (refunds, exemptions, rebates), the ease which this can be accessed, and the time taken for responding to taxpayer queries (see Box 1).

Box 1. Areas and Components of the Tax Administration Quality Index

1. Supporting Taxpayer Information

- The range of information available to taxpayers to explain, in clear terms, what their obligations and entitlements are in respect of each core tax
- The degree to which information is current in terms of the law and administrative policy
- The ease by which taxpayers obtain information from the tax administration
- The time taken to respond to taxpayer and intermediary requests for information
- The extent to which taxpayer input is taken into account in the design of administrative processes and products

2. Filing and Payment of Tax Declarations

- The number of CIT declarations filed by the statutory due date as a percentage of the number of declarations expected from registered CIT taxpayers
- The number of PIT declarations filed by the statutory due date as a percentage of the number of declarations expected from registered PIT taxpayers
- The number of VAT declarations filed by the statutory due date as a percentage of the number of declarations expected from registered VAT taxpayers
- The number of PAYE withholding declarations filed by employers by the statutory due date as a percentage of the number of PAYE declarations expected from registered employers
- The extent to which tax declarations are filed electronically
- The extent to which core taxes are paid electronically

3. Post-filing Processes

- The extent of initiatives to detect businesses and individuals who are required to register but fail to do so
- The process used to assess, rank, and quantify taxpayer compliance risks
- The extent of large-scale automated crosschecking to verify information in tax declarations
- The nature and scope of proactive initiatives undertaken to encourage accurate reporting
- The extent of intelligence gathering and research to identify compliance risks in respect of the main tax obligations
- The nature and scope of the tax audit program in place to detect and deter inaccurate reporting
- Adequacy of the VAT refund system
- The time taken to pay (or offset) VAT refunds
- The extent to which an appropriately graduated mechanism of administrative and judicial review is available to, and used by, taxpayers
- Whether the administrative review mechanism is independent of the audit process
- Whether information on the dispute process is published, and whether taxpayers are explicitly made aware of it
- The time taken to complete administrative reviews
- The extent to which the tax administration responds to dispute outcomes

4. Accountability and Transparency

- Degree of assurance provided by internal audit
- Existence of staff integrity assurance mechanisms

- The extent of independent external oversight of the tax administration's operations and financial performance
- The investigation process for suspected wrongdoing and maladministration
- The mechanism for monitoring public confidence in the tax administration
- The extent to which the tax administration's future directions and plans are made public, and the timeliness of publication
- The extent to which the financial and operational performance of the tax administration is made public, and the timeliness of publication

(2) Filing and Payment

Filing of tax returns is the principal means by which taxpayer's liabilities are determined. Complex tax returns and filing processes impose costs on taxpayers in terms of time spent on filling the return forms, the cost of keeping additional tax-related records, and hiring accountants or lawyers. Streamlining return preparation and filing processes can thus be critical for encouraging voluntary filing by the statutory due dates (see, for instance, McCaherty, 2014).

Promoting the use of electronic filing, introducing pre-filled returns, and being proactive in informing taxpayers about approaching deadlines can help reduce the compliance burden for timely filing. In general, the use of electronic tax filing and payment methods can help reduce the cost of tax payments and the volume of routine processes (e.g., through automatic verification). As such, the percentage of returns that are filed by the statutory due date is a good indicator of the extent to which compliance costs have been reduced as a result of simplified filing processes and electronic filing. The extent to which e-filing reduces compliance costs, however, can vary across countries. In many developing countries, compliance cost savings from electronic filing are often undermined by inefficient procedures associated with e-filing (Yilmaz and Coolidge, 2016), such as additional capital that may need to be invested to adopt e-filing, and the time required to learn about the system.[8]

Our composite sub-index on filing and payment measures the percentage of timely filing for different types of taxes (VAT, personal and corporate income taxes, Pay As You Earn (PAYE) taxes withheld by employers) and assesses the use of electronic filing and payment systems.

(3) Post-filing Processes

Post-filing processes run the gamut from claiming a VAT refund, undergoing a tax audit or appealing a tax assessment, and can impose large costs on businesses. In some countries, firms have to invest more time and effort into the processes occurring after filing of tax returns than into the regular tax compliance procedures (World Bank, 2016). Our index assesses these processes along three key dimensions.

First, we capture the efficacy of the VAT refund system in terms of its adequacy, the procedures followed by refund claimants and the time needed for the tax authorities to process refunds. An

[8] E-filing is associated with higher tax compliance costs if it is mandatory and not optional, if there is paper-based reporting together with e-filing, and if processes are complex (Eichfelder and Vaillancourt, 2014).

effective VAT refund system matters as it affects a firm's cash flow. An efficient risk-based system of processing and payment of refunds in a timely manner improves firms' cash flow, especially for firms that are exporters and young firms that have recently invested in capital assets.

Second, we take into account tax audits. Tax audits can promote voluntary compliance by increasing the probability of detection for noncompliant taxpayers.[9] They also help educate taxpayers of their legal obligations, thereby improving compliance. The impact of audits on compliance, however, critically depends on a properly designed compliance strategy and the quality of audits (Vellutini, 2011). Effective risk management reduces compliance costs of low-risk taxpayers by focusing audit activities on high-risk taxpayers (Khwaja et al., 2011).[10]

The use of big data analytics and automated cross-checking of third party information has made a paradigm shift in compliance management. When businesses are aware that the tax administration has information about their transactions, the cost associated with furnishing data about their transactions is significantly reduced. Third party information also enables tax administrations to prefill returns for taxpayers, thus reducing their compliance costs.[11] Reliance on third party information, however, has its limitations—taxpayers may, for example, respond by focusing their evasion on items not subject to such reporting—but its potential power is proven (see Kleven et al., 2011, for Denmark; Carrillo et al., 2014, for Ecuador).

Finally, a fair and independent dispute resolution mechanism that ensures speedy decisions on disputes is also critical for firm performance as it reduces the time and compliance cost of determination of final liability. We capture the adequacy of tax dispute resolution by assessing whether an appropriately graduated mechanism of administrative and judicial review is available, whether the administrative review mechanism is independent of the audit process, and whether information on the appeal process is published (TADAT, 2015).

(4) Accountability and Transparency

Corruption (or unethical conduct) within the tax administration remains a significant concern in many countries. This may involve bribery by the taxpayer to understate liability or avoid registration, or extortion from them by the threat of over-assessment. Accountability and transparency in tax administration are thus two of the central pillars of good governance in tax administration (IMF,

[9] Under the assumption of expected utility maximization (Andreoni et al., 1998), taxpayers will not pay tax as long as the cost of compliance exceeds the net benefit of noncompliance (see also Slemrod and Yitzhaki, 2002).

[10] A risk-based approach, for instance, takes into consideration different aspects of a business such as historical compliance, industry and firm-specific characteristics, and the size of a business in order to better assess which businesses are most prone to tax evasion (IMF, 2015). From a game theoretic perspective, a risk-scoring mechanism using all the information provided by the taxpayer as well as their profile makes it more difficult for taxpayers to consistently underreport income and avoid audit (Alm and McKee, 2004).

[11] For instance, the use of electronic tracing of payments by the National Tax Service of Korea promoted the use of electronic payments and credit cards and contributed to changing the Korean economy into the world's highest-ranked cashless economy. The positive gains in terms of voluntary compliance and GDP growth has been significant (Sung et al., 2017).

2015). Their institutionalization reflects the principle that tax administrations should be answerable for the way they use public resources and exercise authority professionally, honestly, and without bias or favor. Perceptions of businesses about tax fairness and tax administration quality greatly affect tax compliance decisions. A more legitimate and responsive state is likely an essential precondition for a more adequate level of tax effort (Gaspar et al., 2016).

To enhance public confidence and trust, the tax administration should be openly accountable for their actions within a framework of responsibility to the government and the general public (Bird et al., 2008).[12] Our index assess accountability along the following dimensions: (i) external oversight of tax administration's performance; (ii) independent and impartial investigation of taxpayer's complaints of wrongdoing, maladministration and corruption; (iii) embracing ethical standards and staff integrity policies; and (iv) internal assurance mechanisms to ensure adherence to internal control and governance framework. Transparency implies that the tax administration is open about its performance and future directions and that these are published.

C. Measurement, Weighting and Aggregation

As described in the previous section, the index is comprised of 33 dimensions grouped into four main components or sub-indices. The compilation of these dimensions into the TAQI follows a two-stage process. First, we obtained scores for every dimension as rated by TADAT experts on a four-point 'ABCD' scale. To minimize discretion in scoring, a set of standardized criteria are used in the TADAT framework.

The interpretation of these scores is broadly as follows: 'A' denotes performance that meets or exceeds international good practice. 'B' represents sound performance (i.e., a healthy level of performance but a rung below international good practice). 'C' means weak performance relative to international good practice. 'D' denotes inadequate performance, and is often applied when the requirements for a 'C' rating or higher are not met. Moreover, a 'D' score is given in certain situations where there is insufficient information available to determine and score the level of performance.[13] The underlying rationale is that inability of the tax administration to provide the required data is indicative of management deficiencies and performance monitoring practices relative to a given dimension. In Appendix 1, we provide a more detailed description of the scoring methodology for each dimension.

To arrive at a quantifiable framework, numerical scores were assigned to each of these values. In particular, for each dimension, we convert the 'ABCD' scale to a numerical scale ranging from 0 to 4 where 0 reflects 'D' and 4 reflects 'A'. For some factual questions the coding was binary (0 or 4 score). Other questions allowed for a more detailed scale for their answers, and hence greater differentiation across countries in terms of the various dimensions.

[12] Tax ratios and survey measures of willingness to comply are negatively correlated with corruption (OECD, 2013).

[13] For example, where a tax administration is unable to produce basic numerical data for purposes of assessing operational performance (e.g., in areas of filing, payment, and refund processing).

We then compiled the overall index of tax administration quality (TAQI) and the four sub-indices through simple and unweighted averaging. For example, the *Post-filing* sub-index is the simple average of its 13 dimensions, while the *Accountability and Transparency* sub-index is the simple average of its seven dimensions. The overall index of tax administration strength is then derived as a simple average of the four sub-indices. The advantage of arithmetic averaging is that it is straightforward and transparent. In addition, the absence of strong priors over the weights of the dimensions in each of the sub-indices makes simple averaging the natural benchmark candidate.

Table 1 presents the inter-sub-index correlations. The average correlation among the four sub-indices is below 0.5 with a high coefficient of reliability of 0.8. The results also indicate that the average intra-sub-index correlations (ranging from 0.4 to 0.5) justify the composition of the sub-indices, without raising significant concerns of multicollinearity. The associated reliability coefficient estimates (ranging from 0.7 to 0.8) provide a further indication that our sub-indices are reasonably constructed.

To examine the robustness of our indices, we also considered alternative aggregating and weighting schemes. In particular, different weights and assumptions about the degree of substitutability and complementarity of components were considered. First, we weighted each of our 33 dimensions equally to produce an alternative index, the *TAQI2*. Next, we used Principal Components Analysis (PCA), which is commonly used in the literature, to obtain an alternative index, the *TAQI-PCA*.[14] The rank order correlations between the different approaches are high and significant (Table 2), suggesting that the additive aggregation procedure used for the construction of the benchmark overall index is robust to alternative weighting schemes. Of course, the dimensions and sub-indices can be aggregated in several other meaningful ways, some of which may be equally valid.

III. DATA

As mentioned in the previous section, the construction of the index relies on TADAT data. This new global tool (initiated in 2013) assesses the relative strengths and weaknesses of a country's tax administration system across nine performance outcome areas. TADAT assessments are currently available for over 37 countries but the sample size in our study is restricted by the availability of firm-level surveys. Most of the assessments are confidential which prevents us from showing country-specific index scores. A set of high-level dimensions critical to tax administration performance are linked to these outcome areas and are scored. In particular, a total of 47 measurement dimensions are taken into account in arriving at the dimension scores for a complete TADAT assessment, of which 33 were considered in the construction of the TAQI.[15]

[14] PCA transforms correlated variables into a smaller number of uncorrelated variables called principal components ranked according to how much variability they capture in the data. We use the first principal component, which is the one with the most variability.

[15] TADAT assessments focus on the administration of the major direct and indirect taxes critical to central/federal government revenues The assessments are conducted by an assessment team comprising certified assessors with tax administration experience. The assessment is evidence-based, with the team conducting interviews with the authorities, visiting tax offices in the headquarters and field, and examining documents, processes and IT systems.

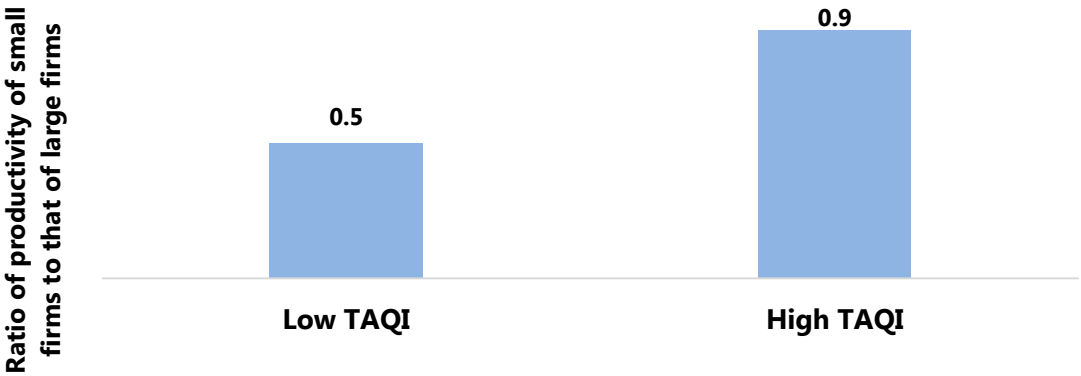
We merge the index constructed using TADAT country-level data with rich firm-level data from the World Bank Enterprise Surveys (ES). The ES uses a common questionnaire and a uniform sampling methodology to produce survey data on manufacturing and service sector firms that is comparable across countries. The stratified random sampling methodology is used to generate a sample large enough to be representative of the non-agricultural formal economy as well as key sectors and firm size classifications. The ES target firms with at least 5 employees, and report on firms' growth in sales and investment, ownership history, age, industry, and other characteristics. The data also contain detailed information on output and production inputs, which we transform into real values using the respective GDP deflator and then convert into US dollars using the yearly average exchange rate.

While the ES are available for many countries, most countries covered are only surveyed once every couple of years. We therefore maximize the overlap between the two by assuming that the TADAT assessments would not have significantly changed had they been undertaken up to 3 years earlier or later, given the time it takes to reform tax administrations. This gives us a dataset for a cross-section of firms from 21 countries which were surveyed following the same methodology, with the surveys undertaken between 2013 and 2016. The countries are Albania, Armenia, DRC, Egypt, Ethiopia, FYR Macedonia, Georgia, Jordan, Kenya, Kosovo, Kyrgyz Republic, Madagascar, Malawi, Malaysia, Namibia, Romania, Serbia, Tanzania, Uganda, Vietnam. and Zambia.

In Tables 3-4, we present summary statistics of the firm and country-level variables. In the sample, 52 percent of firms are small (defined as firms with fewer than 20 employees), and 21 percent are young. The correlation coefficient between small and young firms is low (0.16). Over 50 percent of firms in the sample operate in the manufacturing sector, and 32 percent of firms report tax administration as a major obstacle to the growth of their business. 10 percent of firms in the sample are government-owned, 12 percent have foreign ownership, and 17 percent are exporters. Interestingly, the dummy indicating whether firms report tax administration as a major obstacle to the growth of their business is not correlated with the TAQI (the correlation coefficient is less than .1), suggesting that firm-level perceptions of tax administration can indeed be highly subjective.

Figure 2 examines differences in the average productivity of small and large firms between countries with relatively weak tax administration and countries with relatively strong tax administration as measured by the TAQI. In particular, for each country, we compute the ratio of the average productivity of small firms to the average productivity of large firms. Figure 2 displays the median ratio for each country grouping and shows that for countries with weak tax administration quality, differences in labor productivity between small and large firms tend to be significant. Interestingly, in countries with stronger tax administration quality, the differences in productivity between small and large firms are much smaller, suggesting a weaker association between firm size and productivity. We next turn to an examination of this association using a more rigorous empirical analysis.

Figure 2. Differences in Firm Productivity and the Quality of Tax Administration



Notes: Countries with a low TAQI have an index score of equal or smaller than the median; countries with a high TAQI have an index score of higher than the median. The chart displays the median ratio of average country-level labor productivity of small firms to that of large firms for each country grouping.
Source: World Enterprise Surveys, TADAT database, and own compilation.

IV. RESULTS

A. Empirical Specification

Our empirical specification focuses on the differential impact that the quality of tax administration can have on firm performance of small and young firms using a difference-in-difference approach:

$$PROD_{i,j,k} = \alpha + \gamma_k + \delta_j + \beta_0 SMALL_{i,j,k} + \beta_1 (SMALL_{i,j,k} * TAQI_k) + \beta_2 Z_{i,j,k} + \varepsilon_{i,j,k} \quad (1)$$

$$PROD_{i,j,k} = \alpha + \gamma_k + \delta_j + \beta_0 YOUNG_{i,j,k} + \beta_1 (YOUNG_{i,j,k} * TAQI_k) + \beta_2 Z_{i,j,k} + \varepsilon_{i,j,k} \quad (2)$$

where i, j, and k refer to the firm, industry, and country respectively. We use cross-section data in the sense that we have only one observation for each country and firm. $PROD$ is a measure of firm performance (productivity or sales growth). $SMALL$ and $YOUNG$ are dummy variables that reflect firm size ('1' if the firm has fewer than 20 employees) and firm age ('1' if the firm is younger than 7 years, which is the 25th percentile of firm age in our sample). $TAQI$ represents the overall index of tax administration quality or relevant sub-indices. Z_i is a vector of standard firm-level controls. We also include a full set of country and industry effects. This specification by design controls for all the country-level time-invariant covariates, relating to, for example, policy, institutions, regulatory quality and aggregate growth. The results are unlikely to be affected by reverse causality as the country-wide index of tax administration quality can be seen as exogenous to the individual firm. Standard errors are robust and clustered by industry and country.

The coefficient of interest is β_1 and reflects the impact of tax administration quality on small and young firms, respectively. Given the regressive nature of tax compliance costs, the hypothesis is that it partially mitigates the adverse effects of being a small or young firm on firm performance (captured by the β_0 coefficient). As noted earlier, cross-country firm-level evidence for a large

number of developing countries suggests that larger firms are typically more productive than small firms (Ayyagari et al., 2011; World Bank, 2012). The identifying assumption is that small and young firms are likely to benefit more than large and mature firms from a tax administration that alleviates firms' compliance costs.

We consider three alternative measures of firm performance as dependent variables. The first is labor productivity as measured by sales per employee (in logs). A second measure of firm performance is total real sales growth over the last three years which we winsorize at the bottom 10th and the top 90th percentiles to omit implausibly low and high values. Finally, we consider a measure of firm-level total factor productivity (TFP). In particular, a production function equation whose residuals measure TFP is estimated using the methodology of Levinsohn and Petrin (2003), which corrects for the crucial simultaneity bias arising from the fact that firms make input choices with knowledge of their productivity.[16]

Firm-level controls include a dummy if the firm is government owned, an exporter (i.e., a firm that sells goods or services at least partially in foreign countries), or is partially foreign-owned. The ES also have a question on the firm's perception of the quality and integrity of tax administration. In the survey, enterprise managers were asked to rate the extent to which tax administration obstacles constrained the operation of their business. The ratings were quantified from 1 to 4, with 1 denoting no obstacle and 4 a major obstacle, which is included as a control.

B. Baseline

Tables 5-6 presents our baseline results for different measures of firm performance. Consistent with previous findings from the literature, we find a negative association between firm size and age and labor productivity (Column 1 in Tables 5 and 6, respectively). In particular, the productivity of small and young firms is on average 23 and 18 percent below that of larger and older firms, respectively. However, the interaction term between firm size and age and the index of tax administration quality is positive and statistically significant (Column 2 in Tables 5-6), suggesting that improvements in tax administration can undo some of the adverse effects of small or medium firm size of firm performance. In other words, small and young firms tend be more productive in countries with stronger administration and the resulting lower tax compliance costs.

These results are not only statistically but also economically significant. In particular, the productivity of small firms in countries with relatively weak tax administration (TAQI score of 1.39 which corresponds to the 25th percentile) is on average 45 percent lower than that of larger firms. If the quality of tax administration of such a country improved by one standard deviation (i.e., the TAQI score increased by 0.681), the productivity of small firms would only be 6 percent lower than that of

[16] Levinsohn and Petrin (2003) offer a semi-parametric estimation technique that uses intermediate inputs used by firms as a proxy for unobserved productivity shocks. We obtain TFP using a two-step procedure. In the first step, the coefficient on labor is obtained using semi-parametric techniques. In the second step, the coefficients for material inputs and capital are obtained using generalized method of moments techniques (details of estimation are available upon request).

larger firms. Using another example to illustrate the sizeable magnitude, if a country were to improve the quality of tax administration from the level of Liberia (which scores 0.73 in our index) to Zambia's score (2.33), 81 percent of the productivity gap between small and larger firms could disappear. These results mirror the stylized facts presented in Figure 2.

The baseline specifications use labor productivity or sales per worker as an indicator of firm performance. The advantage is that we are able to maximize the number of firm-level observations. However, this indicator does not capture the dynamics of firm performance and is only a partial measure of productivity. In Columns 3-4, for robustness we use sales growth and TFP estimated using the Levisonhn and Petrin (2003) estimator as the relevant dependent variables. While the sample size changes significantly (particularly for TFP), our coefficient estimates remain largely comparable in terms of magnitude and mostly significant, although not for TFP when the TAQI is interacted with the dummy relating to firm size (Column 4 in Table 5).

C. Robustness

In Tables 7-9 as robustness, we present results controlling for the effects of tax policy which may affect firm performance through the same transmission channel, alternative measures of the index, different firm and industry sub-samples, and the inclusion of country-industry fixed effects

Tax Policy Parameters and the Regulatory Environment

Country fixed effects control for all country-specific factors that have common effects on all firms. However, our results may still be subject to the criticism that other aspects of tax policy and the regulatory environment matter for firm performance, and that these factors also disproportionally affect small and young firms. These effects could, in principle, be correlated with the differential effect of tax administration on firm size and age.

In Table 7, we control for the effects of tax policy using labor productivity as the relevant dependent variable. In each regression, we also include an interaction between the SMALL or YOUNG dummies and a country-level parameter of tax policy including the CIT rate, the VAT rate, and whether the country has a small taxpayer tax regime in place. Given multicollinearity, we cannot reasonably include more than two interaction terms in each of the regressions.

We find that a higher CIT rate is associated with lower firm productivity for small firms, but the association is not statistically significant for young firms. However, the positive association between labor productivity of small and young firms and the TAQI continues to hold in this specification. Similarly, our results on the interaction between the TAQI and firms size and age carry through even when we control the differential effect of the VAT rate (Columns 2 and 5). Finally, our results suggest that while the differential impact of a specialized tax regime for small firms on labor productivity of small firms is not statistically significant (Column 3), the relationship between the TAQI and firm productivity again remains robust.

In Table 8, we perform a similar exercise, but now focus on several World Bank indicators of the regulatory environment and governance, including government effectiveness (GOV-EFFECT),

regulatory quality (REG-QUALITY), and rule of law (RULE-LAW). The correlation between these indicators and our index of tax administration quality is low and never exceeds 0.55. This is reassuring and suggests that our index captures other elements of governance that are not covered by these existing indicators. As can be seen in Table 8, in all specifications, the positive association between the TAQI and labor productivity of small and young firms remains significant and quantitatively similar in magnitude.

Other robustness checks

In Table 9, we provide a battery of additional robustness tests for the interaction between firm size and TAQI (results for firm age are available upon request). First, instead of including industry and country effects separately, we include two-way country-industry effects to control for unobserved industry-specific factors that differ across countries and find that our results remain robust. In Column (2), we test whether focusing only on a subsample of manufacturing firms alters our results. Again, our results remain robust to the smaller sample of firms.

We then test the robustness of our results to the definition of small firms and the potential endogeneity between tax administration and firm size. First, our results could be subject to the criticism that firm size is endogenous and deliberately chosen by firms to avoid being monitored by tax authorities. In Column (3), we use a different definition of small firms to address this concern. In particular, we follow Kneller and Misch (2014) and normalize firm-level employment by the sector-level mean of the country where the firm is located. We then label a firm as 'small' if normalized employment is below the 25th percentile in the distribution across all firms and countries. This procedure removes country-sector specific factors that cause firm size to vary systematically across countries and industries, reflecting, for instance, the desire of firms to remain below a specific size threshold in a particular country and sector.

Second, instead of only focusing on small firms, we consider both small and medium enterprises. In particular, we interact the index of tax administration quality with a dummy indicating whether or not the firm is a small or medium firm (SME) in Column (4). Our original results remain robust in both specifications.

Finally, in Column (5), we also include a dummy for large firms (defined as firms with at least 100 employees) and an interaction term of the large dummy with the TAQI implying that the omitted firm category are medium-sized firms. The results suggest that small firms are less productive than medium-sized firms and benefit disproportionately from improvements in the quality of tax administration, while the reverse holds true for large firms.

Measurement of Tax Administration Quality

In Tables 10-11, we test the robustness of our results to the composition of the index. Column 1 in Tables 10 and 11 report the results using PCA to summarize various dimensions of tax administration. Specifically, the tax administration dimensions are first mapped into one of four distinct aspects of the strength tax administration, and then the main variation commanded by each aspect is extracted through the use of their respective principal components to construct the TAQI-

PCA. This index was constructed using the first component, which captured most of the underlying variation in the data. As before, we find the interaction term of small and young firms with the TAQI-PCA to be positive and significant, suggesting that smaller firms tend to be more productive in countries with stronger tax administrations and lower compliance costs.[17]

In Columns 2-5 we present results with interaction terms for each of the four sub-indices, respectively[18]: (i) supporting taxpayer information (TA_SUB1); (ii) filing and payment (TA_SUB2); (iii) post-filing processes (TA_SUB3); and (iv) accountability and transparency on the part of the tax authorities (TA_SUB4). The interactions with firm size for each of the sub-indices of tax administration are positive and statistically significant in all regressions. While the magnitude of the interaction term to be highest in the case of stronger post-filing processes, a t-test shows that these coefficient estimates are not statistically different from each other. Table 11 reports the results for interactions between the various sub-indices and firm age. While qualitatively similar results obtain, the interaction term with the supporting taxpayer information sub-index is no longer statistically significant. However, the positive and statistically significant association with the other sub-indices carries through in these specifications.

D. Extension using RA-FIT Data

In Table 12, we extend the analysis by replacing the TAQI constructed using TADAT data by the average percentage of electronic filing across all major tax types obtained from the Revenue Administration Fiscal Information Tool (RA-FIT) database. Given that our firm-level data includes unincorporated firms alongside corporations, we consider the electronic filing rate of PIT as well. The RA-FIT is a tax and customs data gathering initiative of the IMF's Fiscal Affairs Department which includes both quantitative and qualitative information and encompasses a mixture of tax administration baseline and profile data, inputs, and performance-related data, but is less detailed than TADAT.

RA-FIT data allows us to complement our previous results in a number of ways. First, while the TAQI is constructed using discrete variables, this indicator is continuous. Second, contrary to TADAT data which is based on experts' assessments, this data is self-reported by the participating tax administrations. Finally, given that RA-FIT and TADAT data differ in terms of their country coverage, using RA-FIT data allows us using a different and expanded sample that includes 30 instead of 21 countries and almost 16,000 firms.[19] Columns (1) and (4) in Table 12 correspond to our baseline specifications in Table 5-6, except that they use the electronic filing rate instead of the TAQI. In

[17] Additional result based on the TAQI2 which is constructed using a different type of weighting, namely the simple average of all 33 dimensions, are qualitatively similar and available upon request.

[18] Multicollinearity considerations prevent us from including interactions with all the sub-indices in the full regression model.

[19] The countries include Argentina, Barbados, Belize, Bolivia, Bosnia and Herzegovina, Brazil, Bulgaria, Chile, Colombia, Costa Rica, Côte d'Ivoire, Dominican Republic, Ecuador, Ethiopia, FYR Macedonia, Ghana, Guatemala, Honduras, Jordan, Kosovo, Madagascar, Mauritius, Mexico, Nicaragua, Paraguay, Peru, Senegal, Tanzania, Uganda, and Uruguay.

Columns (2) and (5), we use combined country-industry effects instead of inserting them separately, and in Columns (3) and (6), we use alternative definitions of small and young firms. In all specifications, our results remain robust in the sense that electronic filing has differential and significant effects on firm performance similarly to the ones we find for the TAQI.[20]

V. CONCLUSION

In this paper we estimate the effects of tax compliance burden on firm performance by constructing a new index of tax administration quality (the TAQI) and examining its heterogeneous effects across firms of different size and age. Our index is based on expert assessments within a well-defined methodological framework and has considerable advantages compared to existing measures. First, it is multidimensional and reflects different aspects of tax administration that are pertinent for the tax compliance burden borne by firms. Secondly, it abstracts from any effects of tax policy, thereby allowing for well-founded policy conclusions on strengthening tax administration. The identification strategy is consistent with overwhelming evidence that small (and to a lesser extent young) firms are subject to much larger tax compliance costs in relative terms.

We show that a stronger tax administration can exert a positive effect on the productivity of small and young firms. These effects are also significant in an economic sense as they may offset a sizeable share of the productivity disadvantage of small and young firms relative to larger and older firms. Our results have important policy implications. Governments often recognize that small firms struggle with relatively large tax compliance costs. However, evidence on the efficacy of the standard tax policy remedy, namely the introduction of simplified small business tax policy regimes, has been mixed. For instance, Engelschalk and Loeprick (2015) find that in Eastern Europe and Central Asia, such regimes do not facilitate business growth and migration into the standard tax regime, and can pose risks to tax revenue generation.

The results of our paper suggest an alternative and equally important way of supporting small and young firms, namely improving those aspects of tax administration that lower tax compliance costs by enhancing taxpayer information, filing, payment and post-filing processes, and strengthening overall accountability and transparency on the part of tax authorities. While such measures are not specifically targeted at small businesses, they can be particularly beneficial for small firms with relatively low turnover and limited profits to defray the cost of compliance, given that they have a significant fixed cost component. The TAQI together from the criteria it is derived from can offer guidance on how such improvements look like in practice.

Our results are subject to a number of caveats. First, the data source used to compile our index does not take into account any special tax regimes for small firms. To the extent that some of these regimes do indeed lower tax compliance costs imposed on small firms, this would imply that we underestimate the effect of quality of tax administration on firm productivity of small firms. Second,

[20] The fact that these results are qualitatively similar to the ones using our overall index of tax administration could also reflect the fact that the electronic filing rate may very well be a proxy of other initiatives of the tax administration that reduce tax compliance burdens—for example a 'client focus' of the tax administration, well established taxpayer services, and in some cases the provision of pre-populated tax return forms.

our firm-level data is confined to the formal sector and does not systematically examine the effects of tax administration quality on the performance of micro-enterprises (less than 5 employees) or voluntary formalization and compliance. These questions are important from a policy perspective in emerging and developing countries as improvements in tax administration could induce informal firms to register and pay taxes. We leave these issues for future research.

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Table 1. Index Inter-Item Correlations

Sub-Indices	Average Inter-Item Correlation	No. of Components	Scale Reliability Coefficient
TA-SUB1	0.38	7	0.65
TA-SUB2	0.52	6	0.77
TA-SUB3	0.38	13	0.65
TA-SUB4	0.51	7	0.76
TAQI (average)	0.45	4	0.76

Table 2. Spearman Rank Correlation Between Alternative Indices

	TAQI	TA-SUB1	TA-SUB2	TA-SUB3	TA-SUB4	TA-VER2	TA-PCA
TAQI	1						
TAQI2	0.99	0.74	0.65	0.90	0.65	1	
TA-PCA	0.96	0.79	0.54	0.84	0.72	0.95	1

Table 3. Summary Statistics of Firm-Level Variables

Variables	Min	Mean	Median	Max	Std. dev.	N
EXPORTER	0	0.174	0	1	0.379	11,354
FOREIGN	0	0.122	0	1	0.327	11,354
GOV	0	0.0163	0	1	0.127	11,354
GROWTH	-69.93	10.70	-2.599	95.36	59.05	11,354
LAB PROD	-1.901	8.798	8.679	18.43	2.205	11,354
MANUFACTURING	0	0.542	1	1	0.498	11,354
PERCEPTION	0	0.311	0	1	0.463	11,354
SMALL	0	0.530	1	1	0.499	11,354
TFP	-1.696	4.825	4.676	15.90	1.168	3,883
YOUNG	0	0.209	0	1	0.407	11,354

Table 4. Summary Statistics of Country-Level Variables

Variables	Min	Mean	Median	Max	Std. dev.	N
TAQI	0.557	1.751	1.986	2.738	0.681	21
TAQI2	0.333	1.722	1.867	2.800	0.758	21
TA-SUB1	0.380	2.269	2.445	3.620	0.974	21
TA-SUB2	0	1.581	1.557	3.778	1.059	21
TA-SUB3	0.205	1.414	1.537	2.425	0.646	21
TA-SUB4	0	1.741	1.713	3.810	0.899	21
CIT	10	21.95	21	35	9.128	20
VAT	6	15.82	16	20	3.870	19
STPR	0	0.375	0	1	0.500	16
RAFIT	10	24.27	25	35	8.254	30

Table 5. Baseline – Size

	Dependent variables			
	Labor productivity	Labor productivity	Sales growth	Total factor productivity
	(1)	(2)	(3)	(4)
SMALL	**-0.226*** [0.048]**	**-1.230*** [0.163]**	**-10.933** [4.298]**	**-0.634*** [0.141]**
YOUNG	**-0.179*** [0.042]**	**-0.163*** [0.041]**	**36.903*** [3.122]**	-0.052 [0.054]
GOV	-0.113 [0.175]	-0.104 [0.177]	-4.021 [4.544]	**0.350* [0.200]**
EXPORTER	**0.321*** [0.060]**	**0.330*** [0.059]**	3.418 [2.216]	**0.247*** [0.046]**
FOREIGN	**0.312*** [0.083]**	**0.308*** [0.081]**	-0.930 [1.694]	**0.136** [0.055]**
PERCEPTION	-0.030 [0.030]	-0.039 [0.030]	1.272 [1.217]	-0.011 [0.033]
SMALL x TAQI		**0.563*** [0.088]**	**7.013*** [2.311]**	0.080 [0.072]
Observations	11,354	11,354	11,354	3,883
Adj. R-squared	0.579	0.584	0.150	0.343
# of countries:	21	21	21	21
# of industries:	23	23	23	20
Country	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes

Table 6. Baseline – Age

	Dependent variables			
	Labor productivity	Labor productivity	Sales growth	Total factor productivity
	(1)	(2)	(3)	(4)
SMALL	**-0.226*** [0.048]**	**-0.224*** [0.048]**	1.659 [1.144]	**-0.490*** [0.035]**
YOUNG	**-0.179*** [0.042]**	**-0.498*** [0.121]**	**20.754*** [6.127]**	**-0.439** [0.199]**
GOV	-0.113 [0.175]	-0.108 [0.175]	-3.893 [4.566]	**0.352* [0.198]**
EXPORTER	**0.321*** [0.060]**	**0.323*** [0.060]**	3.418 [2.257]	**0.246*** [0.046]**
FOREIGN	**0.312*** [0.083]**	**0.310*** [0.083]**	-0.985 [1.716]	**0.135** [0.055]**
PERCEPTION	-0.030 [0.030]	-0.029 [0.030]	1.404 [1.235]	-0.011 [0.033]
YOUNG x TAQI		**0.190*** [0.065]**	**9.499*** [3.354]**	**0.222* [0.115]**
Observations	11,354	11,354	11,354	3,883
Adj. R-squared	0.579	0.580	0.151	0.344
# of countries:	21	21	21	21
# of industries:	23	23	23	20
Country	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes

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

Standard errors clustered by industry & country. Constant is included in all specifications but not shown in tables.

Table 7. Inclusion of Tax Policy Parameters

	Dependent Variable: Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
SMALL	**-0.508****	**-0.783*****	**-1.300*****	**-0.223*****	**-0.204*****	**-0.163*****
	[0.240]	**[0.227]**	**[0.222]**	**[0.050]**	**[0.050]**	**[0.050]**
YOUNG	**-0.162*****	**-0.155*****	**-0.136*****	-0.167	-0.161	**-0.596*****
	[0.042]	**[0.044]**	**[0.046]**	[0.218]	[0.225]	**[0.193]**
GOV	-0.113	-0.077	-0.105	-0.122	-0.090	-0.102
	[0.179]	[0.184]	[0.193]	[0.177]	[0.181]	[0.190]
EXPORTER	**0.332*****	**0.318*****	**0.303*****	**0.322*****	**0.315*****	**0.305*****
	[0.061]	**[0.060]**	**[0.064]**	**[0.063]**	**[0.062]**	**[0.065]**
FOREIGN	**0.298*****	**0.205*****	**0.237*****	**0.305*****	**0.201*****	**0.218*****
	[0.083]	**[0.075]**	**[0.081]**	**[0.086]**	**[0.076]**	**[0.083]**
PERCEPTION	-0.039	-0.026	-0.019	-0.028	-0.016	-0.009
	[0.030]	[0.030]	[0.032]	[0.030]	[0.030]	[0.033]
SMALL x CIT	**-0.020*****					
	[0.006]					
SMALL x TAQI	**0.426*****	**0.478*****	**0.582*****			
	[0.089]	**[0.085]**	**[0.106]**			
SMALL x VAT		**-0.021****				
		[0.010]				
SMALL x STPR			0.062			
			[0.094]			
YOUNG x CIT				**-0.009***		
				[0.005]		
YOUNG x TAQI				**0.126***	**0.174****	**0.195****
				[0.074]	**[0.082]**	**[0.095]**
YOUNG x VAT					**-0.022****	
					[0.011]	
YOUNG x STPR						**0.185****
						[0.087]
Observations	10,883	10,421	9,455	10,883	10,421	9,455
Adj. R-squared	0.591	0.591	0.585	0.586	0.587	0.581
# of countries:	20	19	16	20	19	16
# of industries:	23	23	22	23	23	22
Country	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes

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

Standard errors are clustered by industry & country. Constant is included in all specifications but not shown in table.

Table 8. Inclusion of World Bank Governance Indicators

	Dependent Variable: Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
SMALL	**-0.831*** [0.217]**	**-0.906*** [0.211]**	**-1.077*** [0.206]**	**-0.225*** [0.048]**	**-0.225*** [0.048]**	**-0.224*** [0.047]**
YOUNG	**-0.160*** [0.042]**	**-0.160*** [0.041]**	**-0.163*** [0.041]**	**-0.784*** [0.150]**	**-0.663*** [0.150]**	**-0.860*** [0.148]**
GOV	-0.086 [0.178]	-0.101 [0.177]	-0.098 [0.177]	-0.106 [0.175]	-0.105 [0.175]	-0.106 [0.175]
EXPORTER	**0.334*** [0.058]**	**0.336*** [0.058]**	**0.332*** [0.058]**	**0.324*** [0.060]**	**0.323*** [0.060]**	**0.323*** [0.060]**
FOREIGN	**0.309*** [0.080]**	**0.307*** [0.080]**	**0.309*** [0.080]**	**0.309*** [0.083]**	**0.310*** [0.083]**	**0.309*** [0.083]**
PERCEPTION	-0.040 [0.029]	-0.038 [0.029]	-0.039 [0.030]	-0.027 [0.030]	-0.028 [0.030]	-0.027 [0.030]
SMALL x TAQI	**0.395*** [0.104]**	**0.419*** [0.104]**	**0.503*** [0.093]**			
SMALL x GOV-EFFECT	**0.262*** [0.099]**					
SMALL x REG-QUALITY		**0.237** [0.104]**				
SMALL x RULE-LAW			0.125 [0.135]			
YOUNG x TAQI				**0.297*** [0.073]**	**0.257*** [0.075]**	**0.321*** [0.068]**
YOUNG x GOV-EFFECT				**-0.223*** [0.082]**		
YOUNG x REG-QUALITY					-0.140 [0.085]	
YOUNG x RULE- LAW						**-0.326*** [0.096]**
Observations	11,354	11,354	11,354	11,354	11,354	11,354
Adj. R-squared	0.585	0.585	0.584	0.580	0.580	0.580
# of countries:	21	21	21	21	21	21
# of industries:	23	23	23	23	23	23
Country	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes

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

Standard errors are clustered by industry & country. Constant is included in all specifications but not shown in table.

Table 9. Robustness Checks

	Dependent Variable: Labor Productivity				
	(1)	(2)	(3)	(4)	(5)
SMALL	**-1.143*** **	**-1.584*** **			**-1.019*** **
	[0.174]	**[0.215]**			**[0.157]**
LARGE					**0.632*** **
					[0.219]
YOUNG	**-0.134*** **	-0.092	**-0.209*** **	**-0.199*** **	**-0.166*** **
	[0.041]	[0.058]	**[0.042]**	**[0.042]**	**[0.041]**
GOV	-0.067	0.049	-0.059	-0.061	-0.075
	[0.190]	[0.210]	[0.175]	[0.186]	[0.185]
EXPORTER	**0.307*** **	**0.320*** **	**0.376*** **	**0.374*** **	**0.347*** **
	[0.062]	**[0.063]**	**[0.065]**	**[0.060]**	**[0.058]**
FOREIGN	**0.326*** **	**0.137**	**0.359*** **	**0.365*** **	**0.327*** **
	[0.082]	**[0.093]**	**[0.085]**	**[0.082]**	**[0.079]**
PERCEPTION	-0.036	**-0.069***	-0.038	-0.043	-0.040
	[0.029]	**[0.040]**	[0.030]	[0.030]	[0.029]
SMALL x TAQI	**0.508*** **	**0.706*** **			**0.430*** **
	[0.094]	**[0.114]**			**[0.083]**
LARGE x TAQI					**-0.406*** **
					[0.114]
SMALL2			**9.437*** **		
			[0.462]		
SMALL2 x TAQI			**-4.196*** **		
			[0.228]		
SME				**-1.271*** **	
				[0.224]	
SME x TAQI				**0.690*** **	
				[0.118]	
Observations	11,354	6,159	11,354	11,354	11,354
Adjusted R-squared	0.594	0.589	0.577	0.581	0.586
# of countries:	21	21	21	21	21
# of firms:	11354	6159	11354	11354	11354
# of industries:	23	13	23	23	23
Country	No	Yes	Yes	Yes	Yes
Industry	No	Yes	Yes	Yes	Yes
Country x Industry	Yes	No	No	No	No

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

Standard errors are clustered by industry & country. Constant is included in all specifications but not shown in table.

Table 10. Robustness-Measurement of Tax Administration

	Dependent Variable: Labor Productivity				
	(1)	(2)	(3)	(4)	(5)
SMALL	**-0.250*** [0.041]**	**-0.846*** [0.145]**	**-0.687*** [0.091]**	**-0.904*** [0.126]**	**-0.763*** [0.151]**
YOUNG	**-0.163*** [0.041]**	**-0.169*** [0.042]**	**-0.167*** [0.041]**	**-0.166*** [0.041]**	**-0.175*** [0.042]**
GOV	-0.105 [0.177]	-0.112 [0.176]	-0.100 [0.177]	-0.107 [0.177]	-0.112 [0.176]
EXPORTER	**0.330*** [0.059]**	**0.325*** [0.059]**	**0.328*** [0.059]**	**0.328*** [0.059]**	**0.324*** [0.060]**
FOREIGN	**0.308*** [0.081]**	**0.310*** [0.081]**	**0.306*** [0.082]**	**0.310*** [0.081]**	**0.312*** [0.081]**
PERCEPTION	-0.038 [0.030]	-0.036 [0.029]	-0.034 [0.029]	-0.034 [0.030]	-0.035 [0.029]
SMALL x TA-PCA	**0.247*** [0.038]**				
SMALL x TA-SUB1		**0.275*** [0.063]**			
SMALL x TA-SUB2			**0.305*** [0.054]**		
SMALL x TA-SUB3				**0.454*** [0.079]**	
SMALL x TA-SUB4					**0.287*** [0.078]**
Observations	11,354	11,354	11,354	11,354	11,354
Adj. R-squared	0.584	0.582	0.583	0.583	0.581
# of countries:	21	21	21	21	21
# of industries:	23	23	23	23	23
Country	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes

Table 11. Robustness - Measurement of Tax Administration (continued)

	Dependent Variable: Labor Productivity				
	(1)	(2)	(3)	(4)	(5)
SMALL	**-0.224*** [0.048]**	**-0.225*** [0.048]**	**-0.224*** [0.048]**	**-0.223*** [0.047]**	**-0.226*** [0.048]**
YOUNG	**-0.167*** [0.041]**	**-0.293** [0.117]**	**-0.320*** [0.078]**	**-0.565*** [0.094]**	**-0.319*** [0.085]**
GOV	-0.108 [0.175]	-0.110 [0.175]	-0.110 [0.175]	-0.107 [0.175]	-0.113 [0.175]
EXPORTER	**0.323*** [0.060]**	**0.321*** [0.060]**	**0.323*** [0.060]**	**0.322*** [0.060]**	**0.321*** [0.060]**
FOREIGN	**0.310*** [0.083]**	**0.311*** [0.083]**	**0.310*** [0.083]**	**0.309*** [0.083]**	**0.312*** [0.083]**
PERCEPTION	-0.029 [0.030]	-0.030 [0.030]	-0.030 [0.029]	-0.028 [0.030]	-0.029 [0.030]
YOUNG x TA-PCA	**0.091*** [0.029]**				
YOUNG x TA-SUB1		0.053 [0.047]			
YOUNG x TA-SUB2			**0.102*** [0.039]**		
YOUNG x TA-SUB3				**0.271*** [0.061]**	
YOUNG x TA-SUB4					**0.080* [0.044]**
Observations	11,354	11,354	11,354	11,354	11,354
Adj. R-squared	0.580	0.579	0.579	0.580	0.579
# of countries:	21	21	21	21	21
# of industries:	23	23	23	23	23
Country	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes

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

Standard errors are clustered by industry & country. Constant is included in all specifications but not shown in table.

Table 12. Extension Using RA-FIT Data

	Dependent Variable: Labor Productivity					
	(1)	(2)	(3)	(4)	(5)	(6)
SMALL	**-0.606*** **	**-0.561*** **		**-0.370*** **	**-0.362*** **	**-0.360*** **
	[0.071]	**[0.077]**		**[0.031]**	**[0.031]**	**[0.031]**
YOUNG	-0.070	-0.089	-0.067	**-0.405*** **	**-0.390*** **	
	[0.105]	[0.094]	[0.112]	**[0.087]**	**[0.084]**	
GOV	-0.092	-0.075	-0.075	-0.085	-0.073	-0.099
	[0.142]	[0.146]	[0.143]	[0.143]	[0.146]	[0.144]
EXPORTER	**0.385*** **	**0.392*** **	**0.424*** **	**0.380*** **	**0.390*** **	**0.380*** **
	[0.034]	**[0.035]**	**[0.032]**	**[0.034]**	**[0.034]**	**[0.034]**
FOREIGN	**0.530*** **	**0.525*** **	**0.543*** **	**0.529*** **	**0.524*** **	**0.532*** **
	[0.044]	**[0.044]**	**[0.045]**	**[0.044]**	**[0.044]**	**[0.043]**
PERCEPTION	-0.024	-0.017	-0.038	-0.024	-0.016	-0.022
	[0.023]	[0.023]	[0.023]	[0.023]	[0.023]	[0.023]
SMALL x E-FILING	**0.066*** **	**0.055*** **				
	[0.019]	**[0.020]**				
SME			**-0.495*** **			
			[0.098]			
SME x E-FILING			**0.066*** **			
			[0.025]			
YOUNG x E-FILING				**0.135*** **	**0.123*** **	
				[0.037]	**[0.035]**	
YOUNG2						**-0.484*** **
						[0.095]
YOUNG2 x E-FILING						**0.050** **
						[0.025]
Observations	15,816	15,816	15,816	15,816	15,816	15,816
R-squared	0.449	0.470	0.442	0.450	0.471	0.451
# of countries:	30	30	30	30	30	30
# of industries:	23	23	23	23	23	23
Country	Yes	No	Yes	Yes	No	Yes
Industry	Yes	No	Yes	Yes	No	Yes
Country x Industry	No	Yes	No	No	Yes	No

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

Standard errors are clustered by industry & country. Constant is included in all specifications but not shown in table.

APPENDIX 1. SCORING METHODOLOGY FOR EACH DIMENSION BY AREA

Table A1. Scoring Methodology for Supporting Taxpayer Information

Score	Scoring Criteria
The range of information available to taxpayers to explain, in clear terms, what their obligations and entitlements are in respect of each core tax.	
A/4	(i) Information on the main areas of taxpayer obligations (registration, filing, payment, and reporting of information in tax declarations) and entitlements is readily available in respect of all core taxes. (ii) Information is tailored to the needs of key taxpayer segments, key industry groups, intermediaries, and disadvantaged groups.
B/2.67	(i) Same as A (i). (ii) Information is tailored to the needs of at least one taxpayer segment or industry group, and tax intermediaries.
C/1.33	Same as A (i).
D/0	The requirements for a 'C' rating or higher are not met.
The degree to which information is current in terms of the law and administrative policy.	
A/4	(i) Procedures are in place, and dedicated technical staff are assigned, to ensure information is current. (ii) Taxpayers are made aware of changes in the law or administrative policy through targeted and general communication before the law or policy takes effect.
B/2.67	(i) Same as A (i). (ii) Taxpayers are made aware of changes in the law or administrative policy through general communication before the law or policy takes effect.
C/1.33	(i) Ad hoc actions are taken to update information. (ii) Taxpayers are not always alerted to changes in the law or administrative policy before the law or policy takes effect.
D/0	The requirements for a 'C' rating or higher are not met.
The ease by which taxpayers obtain information from the tax administration.	
A/4	(i) The tax administration provides a broad range of proactive taxpayer education programs. (ii) Information is available through a variety of user-friendly service delivery channels (e.g., telephone, website, etc.) (iii) Information is available at minimal or no cost to taxpayers and intermediaries. (iv) Information and self-service facilities are available to taxpayers and intermediaries at a time convenient to them
B/2.67	(i) The tax administration provides public education programs for micro, small and new firms, and first-time employers. (ii) Same as A (ii). (iii) Same as A (iii).
C/1.33	(i) Public education programs are undertaken on an ad hoc basis. (ii) Same as A (ii). (iii) Same as A (iii).
D/0	The requirements for a 'C' rating or higher are not met.
The time taken to respond to taxpayer and intermediary requests for information.	
A/4	At least 70 percent of telephone enquiry calls are answered within 6 minutes' waiting time.
B/2.67	At least 60 percent of telephone enquiry calls are answered within 6 minutes' waiting time.
C/1.33	At least 50 percent of telephone enquiry calls are answered within 6 minutes' waiting time.
D/0	The requirements for a 'C' rating or higher are not met, or the information available to the TADAT assessors is insufficient to allow an assessment to be made.
The extent of initiatives to reduce taxpayer compliance costs.	
A/4	(i) Simplified record keeping and reporting arrangements exist for small taxpayers. (ii) Frequently asked questions and common misunderstandings of the law detected through service and verification activities are routinely analyzed to improve information products and services. (iii) Secure online facilities provide taxpayers with 24-hour access to registration and tax account details. (iv) Tax declarations and other forms are reviewed regularly to ensure that only information that is needed and used is sought from taxpayers.
B/2.67	Same as A (i) except that pre-filling of tax declarations may not be present, A (ii), and A (iii).

Score	Scoring Criteria
C/1.33	Same as A (i) except that pre-filling of tax declarations may not be present. Same as A (ii).
D/0	The requirements for a 'C' rating or higher are not met.
The use and frequency of methods to obtain feedback from taxpayers on the standard of services provided.	
A-4	(i) The tax administration regularly obtains feedback from taxpayers. (ii) A survey—based on a statistically valid sample of key taxpayer segments—is conducted by an independent third party at least once every 3 years to monitor trends in taxpayer perceptions of tax administration services and products.
B/2.67	(i) Same as A (i). (ii) Same as A (ii) except that surveys are conducted on a less regular basis (i.e., at least once every 5 years) and may be undertaken solely by the tax administration.
C/1.33	(i) Feedback is obtained, but on an ad hoc basis. (ii) Same as B(ii) except that surveys are conducted on an ad hoc basis or not based on statistically valid sample.
D/0	The requirements for a 'C' rating or higher are not met.
The extent to which taxpayer input is taken into account in the design of administrative processes and products.	
A/4	(i) The tax administration regularly consults with key taxpayer groups and intermediaries to identify deficiencies in administrative processes and products. (ii) There is active involvement of taxpayers and intermediaries in the design and/or testing of new processes and products.
B	Same as A (i).
C	The tax administration consults on an ad hoc basis with key taxpayer groups and intermediaries to identify deficiencies in processes and products.
D	The requirements for a 'C' rating or higher are not met.

Table A2. Scoring Methodology for Filing and Paying

Score	Scoring Criteria
The number of CIT declarations filed by the statutory due date as a percentage of the number of declarations expected from registered CIT taxpayers.	
A/4	(i) The ratio is 90 percent and above in respect of all taxpayers for which a CIT declaration is expected. (ii) The ratio is at least 99 percent for all large taxpayers in respect of which a CIT declaration is expected.
B/2.67	(i) The ratio is 75 percent and above up to 90 percent in respect of all taxpayers for which a CIT declaration is expected. (ii) The ratio is at least 95 percent for all large taxpayers in respect of which a CIT declaration is expected.
C/1.33	(i) The ratio is 50 percent and above up to 75 percent in respect of all taxpayers for which a CIT declaration is expected. (ii) The ratio is at least 90 percent for all large taxpayers in respect of which a CIT declaration is expected.
D/0	The requirements for a 'C' rating or higher are not met, or the information available to the TADAT assessors is insufficient to allow an assessment to be made.
The number of PIT declarations filed by the statutory due date as a percentage of the number of declarations expected from registered PIT taxpayers.	
A/4	The ratio is 90 percent and above.
B/2.67	The ratio is 75 percent and above up to 90 percent.
C/1.33	The ratio is 50 percent and above up to 75 percent.
D/0	The requirements for a 'C' rating or higher are not met, or the information available to the TADAT assessors is insufficient to allow an assessment to be made.
The number of VAT declarations filed by the statutory due date as a percentage of the number of declarations expected from registered VAT taxpayers.	
A/4	(i) The ratio is 90 percent and above in respect of all taxpayers for which a VAT declaration is expected. (ii) The ratio is at least 99 percent for all large taxpayers in respect of which a VAT declaration is expected.
B/2.67	(i) The ratio is 75 percent and above up to 90 percent in respect of all taxpayers for which a VAT declaration is expected.

Score	Scoring Criteria
	(ii) The ratio is at least 95 percent for all large taxpayers in respect of which a VAT declaration is expected.
C/1.33	(i) The ratio is 50 percent and above up to 75 percent in respect of all taxpayers for which a VAT declaration is expected. (ii) The ratio is at least 90 percent for all large taxpayers in respect of which a VAT declaration is expected.
D/0	The requirements for a 'C' rating or higher are not met, or the information available to the TADAT assessors is insufficient to allow an assessment to be made.
The number of PAYE withholding declarations filed by employers by the statutory due date as a percentage of the number of PAYE declarations expected from registered employers.	
A/4	The ratio is 90 percent and above.
B/2.67	The ratio is 75 percent and above up to 90 percent.
C/1.33	The ratio is 50 percent and above up to 75 percent.
D/0	The requirements for a 'C' rating or higher are not met, or the information available to the TADAT assessors is insufficient to allow an assessment to be made.
The extent to which tax declarations are filed electronically.	
A/4	(i) At least 85 percent of declarations are filed electronically for each of the core taxes. (ii) All large taxpayers file core tax declarations electronically.
B/2.67	(i) At least 70 percent of declarations are filed electronically for each of the core taxes. (ii) At least 80 percent of large taxpayers file core tax declarations electronically.
C/1.33	At least 50 percent of declarations are filed electronically for at least two core taxes.
D/0	The requirements for a 'C' rating or higher are not met.
The extent to which core taxes are paid electronically.	
A/4	Electronic payments account for more than 75 percent of the value of total tax collections for each of CIT, PIT, VAT, and PAYE.
B/2.67	Electronic payments account for more than 50 percent of the value of total tax collections for each of CIT, PIT, VAT, and PAYE.
C/1.33	Electronic payment facilities are used for at least one of the 4 core taxes.
D/0	The requirements for a 'C' rating or higher are not met.

Table A3. Scoring Methodology for Postfiling Processes

Score	Scoring Criteria
The extent of initiatives to detect businesses and individuals who are required to register but fail to do so.	
A/4	(i) The tax administration's annual operational plans specify initiatives to detect unregistered businesses and individuals, including at least: a. Systematic use of third party information sources; and b. A program of inspections of business premises and traders. (ii) Evidence exists of actions and results during the past year in detecting unregistered businesses and individuals.
B/2.67	(i) Same as A (i) (a). (ii) Same as A (ii).
C/1.33	Evidence exists of ad hoc actions and results during the past year in relation to detecting unregistered taxpayers.
D/0	The requirements for a 'C' rating or higher are not met.
The extent of intelligence gathering and research to identify compliance risks in respect of the main tax obligations.	
A/4	The tax administration builds knowledge of compliance levels and current and emerging risks by: (i) Analyzing the results of environmental scans undertaken by the tax administration as part of its multi-year strategic planning; (ii) Gathering and interpreting data from a range of external sources; (iii) Gathering and interpreting data from a range of internal sources including different studies and research
B/2.67	The tax administration builds knowledge of compliance levels and risks by: same as A (ii) and (iii).

Score	Scoring Criteria
C/1.33	The tax administration's intelligence gathering and research initiatives are less comprehensive and mostly limited to internal data sources.
D/0	The requirements for a 'C' rating or higher are not met.
The process used to assess, rank, and quantify taxpayer compliance risks.	
A/4	A structured risk assessment process—of the kind described in contemporary management literature and/or depicted, for example, in IMF and OECD publications as suitable for use by tax administrations—is in place as part of a multi-year strategic planning process to assess and prioritize compliance risks for all core taxes, the four main compliance obligations, and key taxpayer segments.
B/2.67	Similar to A, except that the risk assessment process is not part of a multi-year strategic planning process. The process is, however, linked to the tax administration's broader annual business planning.
C/1.33	A less structured risk assessment process is in place to assess and prioritize compliance risks for all core taxes and the four main compliance obligations.
D/0	The requirements for a 'C' rating or higher are not met.
The nature and scope of the tax audit program in place to detect and deter inaccurate reporting.	
A/4	The tax administration's audit program: (i) Covers all core taxes. (ii) Covers key taxpayer segments, weighted towards large taxpayers and other high-risk segments and economic sectors. (iii) Selects audit cases centrally on the basis of assessed risks. (iv) Uses a range of audit types, and audit methodologies (i.e. direct and indirect). (v) Routinely evaluates the impact of audits on levels of taxpayer compliance.
B/2.67	The tax administration's audit program: (i) Same as A (i). (ii) Covers key taxpayer segments, weighted towards at least large taxpayers. (iii) Same as A (iii). (iv) Same as A (iv).
C/1.33	(i) The tax administration's audit program: (ii) Same as A (i). (iii) Selects audit cases on the basis of assessed risks in a decentralized manner. (iv) Uses a range of audit types.
D/0	The requirements for a 'C' rating or higher are not met.
The extent of large-scale automated crosschecking to verify information reported in tax declarations.	
A/4	There is large-scale automated crosschecking of amounts reported in PIT and CIT declarations with information from all of the following sources: (i) VAT declarations. (ii) Banks/financial institutions. (iii) Employers. (iv) Three or more Government agencies). (v) Stock exchanges and/or shareholder registries of listed companies. (vi) Social security agency or agencies (for purposes of crosschecking reported employment income). (vii) Online (internet-based) vendors.
B/2.67	There is large-scale automated crosschecking of amounts reported in PIT and CIT declarations with information from A (i), (ii), (iii), and (iv).
C/1.33	There is large-scale automated crosschecking of amounts reported in PIT and CIT declarations with information from, at least, VAT declarations, employers, and two Government agencies.
D/0	The requirements for a 'C' rating or higher are not met.
The nature and scope of proactive initiatives undertaken to encourage accurate reporting.	
A/4	(i) A system of public and private binding rulings is in place. (ii) Cooperative compliance arrangements are entered into with qualifying taxpayers.
B/2.67	Same as A (i).
C/1.33	A system of public binding rulings is in place.
D/0	The requirements for a 'C' rating or higher are not met.
The extent to which an appropriately graduated mechanism of administrative and judicial review is available to, and used by, taxpayers.	
A/4	(i) A tiered review mechanism of the following kind exists: a. First stage—independent single (i.e. not multi-layered) administrative review process within the tax administration. b. Second stage—review by an independent external specialist tax tribunal, review board or committee, or court where the taxpayer is dissatisfied with the outcome of an administrative review. An alternative fast-track dispute resolution process involving arbitration may also be in place. c. Final stage—review by a higher court to resolve remaining disputes concerning legal interpretation and facts. (ii) Taxpayers use the formal dispute process.

Score	Scoring Criteria
B/2.67	(i) The tiered review mechanism described in A (i) is in place with the exception that either the administrative review process within the tax administration is multi-layered or an independent external specialist tax tribunal, review board or committee, or court does not exist and generalist lower courts provide the first avenue of appeal for a taxpayer dissatisfied with the outcome of the administrative review process. (ii) Same as A (ii).
C/1.33	(i) The tiered review mechanism described in A (i) is in place but the administrative review process within the tax administration is multi-layered and there is no independent external specialist tax tribunal, review board or committee, or court. (ii) Same as A (ii).
D/0	The requirements for a 'C' rating or higher are not met.
Whether the administrative review mechanism is independent of the audit process.	
A/4	(i) An administrative review unit that is physically and organizationally independent of the audit department conducts all administrative reviews. (ii) Objective review procedures are documented and applied.
B/2.67	(i) Designated review officers located in the audit department conduct all administrative reviews. (ii) Same as A (ii).
C/1.33	(i) Administrative reviews are conducted by auditors separate from those involved in the audit of the taxpayer. (ii) Same as A (ii).
D/0	The requirements for a 'C' rating or higher are not met.
Whether information on the dispute resolution process is published, and whether taxpayers are explicitly made aware of it.	
A/4	(i) General information on taxpayer dispute rights and the dispute resolution process is publicly available (e.g., on the tax administration's website). (ii) Auditors are required by written instruction to explicitly inform taxpayers of their dispute rights and the associated dispute procedures. (iii) Information on dispute rights and associated dispute procedures is specifically included in audit finalization letters, notices of assessment, and notifications of administrative review outcomes.
B/2.67	(i) Same as A (i). (ii) Same as A (iii).
C/1.33	Same as A (i).
D/0	The requirements for a 'C' rating or higher are not met.
The time taken to complete administrative reviews.	
A/4	The administrative review stage is completed for at least 90 percent of cases within the lower of 30 calendar days or the statutory deadline.
B/2.67	The administrative review stage is completed for at least 90 percent of cases within the lower of 60 calendar days or the statutory deadline.
C/1.33	The administrative review stage is completed for at least 90 percent of cases within the lower of 90 calendar days or the statutory deadline.
D/0	The requirements for a 'C' rating or higher are not met, or the information available to the TADAT assessors is insufficient to allow an assessment to be made.
The extent to which the tax administration responds to dispute outcomes.	
A/4	There is regular monitoring and analysis of dispute outcomes which is taken into account in the formulation or adjustment of policy, legislation, and administrative procedures.
B/2.67	Dispute outcomes of a material nature are analyzed. This analysis is taken into account in the formulation or adjustment of policy, legislation, and administrative procedures.
C/1.33	Some ad hoc analysis of dispute outcomes is undertaken. Some examples exist in the past 3 years where this analysis has been taken into account in the formulation or adjustment of policy, legislation, and administrative procedures.
D/0	The requirements for a 'C' rating or higher are not met.

Table A4. Scoring Methodology for Accountability and Transparency

Score	Scoring Criteria
Assurance provided by internal audit.	
A/4	(i) The tax administration has an organizationally independent internal audit unit reporting directly to an audit committee. (ii) There is an annual internal audit plan comprising internal control checks, operational performance audits, information technology systems audits and financial audits. The program provides wide coverage and scrutiny of key operations, revenue accounting, and internal financial management. (iii) There is regular training of internal auditors in audit methodologies. (iv) There is independent review of internal audit operations and systems at least every five years. (v) There is a central repository of internal control policies, processes and procedures. (vi) IT system controls are in place to detect incidents that threaten the confidentiality and integrity of tax administration data. Specifically, audit trails of user access and changes made to taxpayer data exist, together with effective surveillance by internal audit, including through use of system-generated reports and other audit tools.
B/2.67	(i) The tax administration has an organizationally independent internal audit unit reporting directly to the tax administration head or board. (ii) Same as A (ii). (iii) Same as A (iii). (iv) There is an independent review of internal audit operations and systems at least every seven years. (v) Internal control policies, processes, and procedures are adequately documented. (vi) Same as A (vi).
C/1.33	(i) There is an internal audit function but it does not report directly to the tax administration head or board. (ii) There is an annual internal audit plan covering, as a minimum, internal control checks and financial audits (the plan may not include operational performance audits or information systems audits). (iii) Internal auditors are given ad hoc training in audit methodologies. (iv) Audit trails of user access and changes made to taxpayer data exist.
D/0	The requirements for a 'C' rating or higher are not met.
Staff integrity assurance mechanisms.	
A/4	(i) The tax administration has an organizationally independent internal affairs or equivalent unit. It reports directly to the tax administration head or deputy head in recognition of the sensitive nature of its responsibilities. (ii) The internal affairs or equivalent unit: a. Has appropriate investigative powers, and exercises these powers with due process; b. Provides leadership to the formulation of integrity and ethics policy, including codes of conduct; c. Cooperates with relevant enforcement agencies (e.g., anti-corruption agency, police, and public prosecutor); d. Maintains integrity-related statistics for the organization, while preserving confidentiality; and e. The integrity statistics are publicly reported.
B/2.67	(i) Same as A (i). (ii) Same as A (ii) (a), (b) and (c).
C/1.33	(i) The tax administration has an internal affairs unit but it does not report directly to the tax administration head or deputy head. (ii) Same as A (ii) (a).
D/0	The requirements for a 'C' rating or higher are not met.
The extent of independent external oversight of the tax administration's operations and financial performance.	
A/4	(i) There is an annual audit of the tax administration's financial statements by an external review body (e.g., government auditor or other independent entity). (ii) There is an annual program of operational performance audits by an external review body (e.g., government auditor). (iii) External review findings are responded to by the tax administration. (iv) External review findings and the response of the tax administration or Ministry of Finance to the findings are publicly reported.
B/2.67	(i) Same as A (i). (ii) Same as A (ii). (iii) Same as A (iii).
C/1.33	(i) Same as A (i). (ii) Same as A (iii).
D/0	The requirements for a 'C' rating or higher are not met.
The investigation process for suspected wrongdoing and maladministration.	

Score	Scoring Criteria
A/4	(i) An ombudsman or equivalent authority routinely investigates complaints from taxpayers about treatment they have received from the tax administration. (ii) Systemic problems identified by the ombudsman, and recommended actions to fix them, are reported to the tax administration and government. (iii) An anti-corruption agency oversees tax administration anti-corruption policies and investigates the most serious cases of alleged corrupt conduct of tax officials. (iv) There is regular (e.g., monthly) and systematic monitoring and reporting to senior management of actions taken in response to recommendations of the tax ombudsman and anti-corruption agency.
B/2.67	(i) Same as A (i). (ii) Same as A (iii). (iii) Same as A (iv).
C/1.33	(i) An ombudsman or equivalent authority exists but investigates, on an ad hoc basis only, complaints from taxpayers about treatment they have received from the tax administration. (ii) An anti-corruption agency exists and investigates cases of alleged corrupt conduct of tax officials, but does not oversee the tax administration's anti-corruption policies. (iii) There is limited evidence that findings and recommendations on corruption and maladministration are acted upon systematically by the tax administration.
D/0	The minimum performance requirements described in 'C' above are not met.
The mechanism for monitoring public confidence in the tax administration.	
A/4	(i) An independent third party conducts a survey—based on a statistically valid sample of key taxpayer segments—at least every 2 years to monitor trends in public confidence in the tax administration. (ii) The results of the survey are made public within 6 months of completion. (iii) The tax administration takes the survey results into account in reviewing its integrity framework and public relations campaigns.
B/2.67	(i) An independent third party conducts a survey—based on a statistically valid sample of key taxpayer segments—at least every 3 years to monitor trends in public confidence in the tax administration. (ii) The results of the survey are made public within 9 months of completion. (iii) The tax administration takes the survey results into account in reviewing its integrity framework.
C/1.33	A survey—based on a statistically valid sample of the taxpayer population—is conducted at least every 4 years to monitor trends in public confidence in the tax administration. The survey may be conducted by an independent third party or by the tax administration itself.
D/0	The requirements for a 'C' rating or higher are not met.
The extent to which the financial and operational performance of the tax administration is made public, and the timeliness of publication.	
A/4	(i) There is an annual report to government outlining the full financial and operational performance of the tax administration. (ii) The annual report is made public within 6 months of the end of the fiscal year.
B/2.67	(i) Same as A (i). (ii) The annual report is made public within 9 months of the end of the fiscal year.
C/1.33	(i) Same as A (i). (ii) The annual report is made public within 12 months of the end of the fiscal year.
D/0	The requirements for a 'C' rating or higher are not met.
The extent to which the tax administration's future directions and plans are made public, and the timeliness of publication.	
A/4	Strategic and operational plans are made public in advance of the period covered by the plans.
B/2.67	Strategic and operational plans are made public within 3 months of the commencement of the period covered by the plans.
C/1.33	Elements of the plans are made public within 3 months of the commencement of the period covered by the plans.
D/0	The requirements for a 'C' rating or higher are not met.

APPENDIX 2. VARIABLES, DEFINITIONS AND DATA SOURCES

Variable	Description	Source
LAB_PROD	Sales per employee (log)	ES
TFP_LP	Total factor productivity based on Levinsohn and Petrin estimator (log)	ES
GROWTH	Total real growth of firm sales in percent over last 3 years (using variables containing contemporaneous sales and sales from 3 years ago); winsorized at the bottom 10th and the top 90th percentiles	ES
SME	Dummy (1 if firm has fewer than 100 employees)	ES
SMALL	Dummy (1 if firm has fewer than 20 employees)	
SMALL2	Dummy (1 if number of employees divided by country-sector mean below 25th percentiles across all firms and countries)	
LARGE	Dummy (1 if firm has at least 100 employees)	
YOUNG	Dummy (1 if firm is younger than 7 years which corresponds to 25th percentile of age distribution in whole sample)	ES
YOUNG2	Dummy (1 if firm is younger than 5 years)	
GOV	Dummy (1 if firm is at least partially government owned)	ES
EXPORTER	Dummy (1 if firm exports)	ES
FOREIGN	Dummy (1 if firm is partially foreign owned)	ES
PERCEPTION	Dummy (1 if firm perceives tax administration as major constrained)	ES
MANUFACTURING	Dummy (1 if firm is part of manufacturing sector)	ES
TAQI	Tax administration quality index (scale 0 to 4), sub-indices unweighted	TADAT
TAQI2	Tax administration quality index (scale 0 to 4), sub-indices weighted	TADAT
TAQI-PCA	Tax administration quality index, first component from principal component analysis (scale 0 to 4) version 2	TADAT
TA-SUB1	Tax administration quality sub-index for area 1 (scale 0 to 4)	TADAT
TA-SUB2	Tax administration quality sub-index for area 2 (scale 0 to 4)	TADAT
TA-SUB3	Tax administration quality sub-index for area 3 (scale 0 to 4)	TADAT
TA-SUB4	Tax administration quality sub-index for area 4 (scale 0 to 4)	TADAT
VAT	Statutory standard VAT rate (in percent]	IMF
CIT	Top statutory CIT rate (in percent)	IMF
VATPROD	VAT collections by the multiple of GDP and the VAT rate	USAID
CITPROD	Total corporate income tax revenue divided by the multiple of GDP and the corporate income tax rate	USAID
STPR	Dummy (1 if country has small taxpayer regime)	KPMG
REG-QUALITY	Perception of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. (-2.5 = weak to 2.5 = strong)	WGI
GOV-EFFECT	Perception of the quality of public services, the quality of the civil service and the degree of its independence from political pressures etc. (-2.5 = weak to 2.5 = strong)	WGI
RULE-LAW	Perception of the extent to which agents have confidence in and abide by the rules of society (-2.5 = weak to 2.5 = strong)	WGI
E-FILING	Average share of electronic filing across major tax types in percent (log)	RA-FIT