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Value-Added Tax and Economic Efficiency: Role of Country Governance

Summary: This paper examines the impact of VAT on economic efficiency, which while regarded as distortionary remains inevitable for economic development. Using data from 115 countries from 1984 to 2014, this research further investigates the moderating role of country governance on the link between VAT and economic efficiency. The results suggest that the extent to which country governance mitigates the effect of VAT on economic efficiency is contingent upon the way the country groups prioritize the development of each institutional factor. We find that high corporate tax countries benefit more from higher quality country governance. These findings confirm the role of country governance in better enforcement of tax policy to create less detrimental effects for economic growth. Therefore, better country governance makes taxation more affordable in high corporate tax countries.

Keywords: Economic efficiency, Value-added tax, Country governance, Generalized method of moments, Data envelopment analysis.

JEL: C23, E69, H25, O11, O43.

Paul R. Krugman et al. (1992) argue that value-added tax (VAT) is a superior tool to improve tax collection efficiency, leading to higher economic efficiency through greater redistribution of government expenditures. However, VAT is often linked to higher inflation and lower consumption, savings and investments, reducing economic efficiency (Iris Claus 2013). As VAT is regressive, it leads to greater welfare loss among the poor; thus, its positive effect on economic efficiency is dubious. Further, VAT fosters greater income inequality because the poor spend a higher percentage of their income on VAT than the wealthy (see M. Shahe Emran and Joseph E. Stiglitz 2007). Hence, there is a trade-off between tax efficiency and economic efficiency. In countries with poor institutions, the regressive effect of VAT may be serious when corruption is rampant and VAT refunds are slow or delayed. Hence, this research has two research questions: (1) Does VAT reduce economic efficiency? (2) What role does institutional quality play in the link between VAT and economic efficiency?

This research aims to identify a set of country governance factors that regulators should watch to mitigate the regressive effect of VAT. This paper adds value to the existing literature by examining the interaction effect of tax policy (i.e. VAT) and country governance (i.e. institutional quality), as opposed to merely investigating the

main effect of country governance on economic outcomes (see Alberto Chong and César Calderón 2000; Sanjeev Gupta, Hamid Davoodi, and Rosa Alonso-Temme 2002; Robert J. Barro 2003; Dalia S. Hakura 2004; Carlos Góes 2016). The main motivation of this study is the assertion by Douglass C. North (1993) that differences in institutional quality could best explain comparative economic growth as a set of fundamental criteria for a country economic performance.

The rest of the paper is organized as follows. Section 1 reviews the literature on the impact of VAT and institutional quality on economic efficiency. Section 2 elaborates on the methodology used. Section 3 discusses the results, while Section 4 concludes.

1. Literature Review

1.1 VAT and Efficiency

Economic efficiency refers to the ability of a country to fully utilize the factors of productions to produce a given level of economic output. A country that is economically efficient achieves Pareto efficiency, in which the society achieves maximum economic value and welfare. An economically inefficient country will lose competitive advantages in the long-run due to failure in resource allocation, hence affecting long-term economic development. Classicalists assert that taxation contributes to economic inefficiency (Alan J. Auerbach and James R. Hines Jr. 2002). Similarly, Eric M. Engen and Jonathan Skinner (1996) pointed out that taxation reduces capital investment and productivity growth due to a decrease in marginal productivity of capital and labor, hence resulting in economic inefficiency. Consequently, governments around the globe continuously embark on various tax reforms in order to reverse the negative effects of taxation on economic efficiency.

Tax reforms are mainly based on the macroeconomic perspectives, where the government focuses on reducing the tax rates and composition in order to increase the return on investment. However, Richard M. Bird and Eric M. Zolt (2014) observed that the success of the tax reform is mainly seen in developed economies. Developing countries often suffer from an inefficient tax collection and management. VAT has become a popular tool in developing countries to improve tax collection. It is a consumption tax based on goods and services consumed by all individuals, thus making it a favorable method to increase tax revenue. VAT was originally introduced in France in 1954, followed by most of Western Europe and Latin America during the 1960s and 1970s, and later by high profile industrialized countries outside the European Union, such as Australia, Canada and Japan, in the 1980s.

VAT contributes to better allocation of firm resources, which then improves economic efficiency. This is because the governments use VAT revenue to finance public goods and build better infrastructure to spur economic activities. However, VAT is regressive because it reduces the disposable income of low-income groups. Notwithstanding, VAT remains the preferred choice for tax reform around the world possibly due to the fact that it has the least harmful effect on economic output than the effect of direct taxes (Åsa Johansson et al. 2008; Jens Matthias Arnold et al. 2011). In fact, VAT is optimal according to production efficiency theorem, because a uniform

VAT system contributes to positive effects in the distribution of welfare among the economic agents (Peter A. Diamond and James A. Mirrlees 1971). Michael Keen and Stephen Smith (2006) and Keen and Ben Lockwood (2010) further support the role of VAT in improving economic efficiency, as it reduces administrative costs, rent-seeking and fraud activities in the economic sector. Keen and Lockwood (2010) also argue that VAT is more efficient than turnover and sales taxes, because it compensates for the revenue loss from the reduction in tariffs in the case of trade liberalization.

In the other camp, opponents have always regarded VAT as a regressive tax because it is based on consumption rather than income. Since low-income earners spend a greater percentage of their annual income on consumption, they pay a greater percentage of their income on VAT compared with high-income earners (Alan A. Tait 1991). The impact of VAT on economic efficiency was first suggested by Diamond and Mirrless (1971). They opine that taxation on intermediate goods leads to production inefficiency. This assertion is consistent with the findings of Daron Acemoglu, Michael Golosov, and Aleh Tsyvinski (2008) that taxation on intermediate goods and services affects the labor supply and the levels of capital stock, thus lowering economic efficiency.

Nevertheless, Keen and Lockwood (2010) suggest that VAT could improve economic efficiency as evidenced by their study on 143 countries. They find that an efficient tax collection as a result of implementing VAT reduces the deadweight losses. However, this finding is still inconclusive in the empirical literature. For example, Marius Ikpe and Alwell Nteegah (2013) found that VAT on intermediate goods leads to higher general price level in Nigeria due to higher production cost and lower aggregate outputs in the economy. Such a situation will eventually lead to economic inefficiency because higher productions cost distorts the allocation of resources. These findings are consistent with the argument of Carl S. Shoup (1989) that VAT may cause the consumer to reduce their consumption on goods and services, which in turn affects the labor productivity, eventually leading to lower economy efficiency.

Furthermore, higher price levels due to VAT distorts individuals' decisions, resulting in efficiency loss (Joseph A. Pechman 1987). The study of Martin Feldstein (1995) corroborates this argument in which they find that the shift from income tax to consumption tax is more likely to increase the interest rates, thus raises cost of borrowing. According to Claus (2013), the higher cost of borrowing distorts savings and investments decisions, which dampens business cycles and results in efficiency loss. On the other hand, John Piggott and John Whalley (2001) find that in Canada, VAT leads to a in poorer society welfare due to higher scale of inefficient informal production and reduces the aggregate efficiency. Emran and Stiglitz (2005) also observe that VAT reduces the welfare of the developing nations.

The implementation of VAT is highly dependent on its mechanisms and the process though which it is implemented. Brita Bye, Birger Strøm, and Turid Åvitland (2012) provide evidence to support this notion where they observe that in Norway, an imperfect extension of the VAT leads to economic losses as opposed to the general and uniform VAT that covers all goods and services. VAT may result in reduction of the amount of goods and services consumed, even if spending remains unchanged. This leads to a deadweight loss that is inefficiency in the economy, reducing future

consumption rather than current spending (Feldstein 2008). Hence, we hypothesize that:

$$H_1: \textit{VAT reduces economic efficiency.}$$

1.2 VAT, Country Governance and Economic Efficiency

Although economists have long accepted the role of institutions in economic development, they still debate the precise meaning of this concept. The most common and widely accepted definition of institutions is derived from the work of North (1981, 1990, 1993). The institutional quality serves as the key factors to determine the performances of the government and economy (Rafael La Porta et al. 1999; Daniel Kaufmann, Aart Kraay, and Pablo Zoido-Lobatón 2002; Saima Shafique, Rashida Haq, and G. M. Arif 2006). A government which practices good governance has better relationships with its citizens, has larger tax resources and good financial development (Olivia McDonald and Kadi Jumu 2008). In fact, Chong and Mark Gradstein (2007) argue that the role of institutional quality is important to understand the size and the quality of the public sector and its effect on economic growth. They stipulate that when the enforcement quality is high, taxation to finance public spending is less detrimental to economic growth, making taxation more affordable, even in higher-tax countries. They find evidence that institutional quality significantly affects a country's economic development despite high tax rate. This is consistent with the results by Philip Keefer and Stephen Knack (1997), who observe that economic growth in low-income countries is slow due to a weak institutional framework as measured by rule of law, corruption, and high risk of expropriation and contract repudiation. This is supported by Ahmad Jafari Samimi and Fereshte Talesh Salehani (2010), who argue that institutional quality provides the linkages between taxation and economic growth.

Furthermore, Claude Ménard and Mary M. Shirley (2005) suggest that the rules of social interaction can reduce uncertainty, control the environment and lower transaction costs. These include the explicit and implicit behavioural norms that influenced economic behaviour and outcomes (Dani Rodrik and Arvind Subramanian 2003), which contribute to the overall economic efficiency. North (1993) argued that differences in institutions could best explain the comparative economic growth as it served as the fundamental criteria for a country economic performance. High institutional quality is crucial because it leads to better improvements to challenge the existing technology and products whilst at the same time allow them to gain profit from their inventions and help to promote technological change and innovations. This is vital for economic efficiency (Acemoglu et al. 2008; Rasha Hashim Osman, Constantinos Alexiou, and Persefoni Tsaliki 2012).

Studies on institutional quality mostly focus on corruption and economic growth. Gupta, Davoodi, and Alonso-Temme (2002) found that corruption widens income inequality, thereby reducing the government's tax revenue base and resulting in lower economic growth and efficiency. Additionally, Kwabena Gyimah-Brempong (2002) found that corruption led to diversion towards rent-seeking activities rather than focusing on productive activities and consequently resulted in economic inefficiency. The economic efficiency of a country is also affected because corruption reduces investment and increases ineffective government spending (Paolo Mauro 1995; Vito

Tanzi 1998). Moreover, Shafique, Haq, and Arif (2006) found that a corrupt government caused huge resource misallocation, resulting in economic inefficiency.

On the other hand, Barro (2003) states that the rule of law is positively related to the *per capita* gross domestic products in 113 countries from 1965 to 1995. This implies that better rule of law improves the property rights and hence provides incentive for higher investment and economic efficiency. This is because democracy serves as a mechanism for the government's commitment on its investment in capital accumulation in the private sector. This is consistent with the findings by Mauro (1995), who suggests that government institutional efficiency positively affects investment and output growth. In addition, Chong and Calderón (2000) show that the influence of institutional quality on economic growth is more pronounced in poorer countries than in higher income countries. This has been supported by Hakura (2004) in his analysis on the causes of low economic performance in the Middle East and North African states.

A recent study by Góes (2016) supports the view that higher institutional quality promotes higher innovations that contributes to higher real income *per capita*. Therefore, innovations are exogenous to institutional quality, which is crucial for economic efficiency. Further, Góes (2016) observes that the institutional quality has a different dynamic for the developed and developing economies. The effect is greater in the former, which implies that institutional quality is beneficial at a lower level and diminishes at a higher level.

Consequently, institutional quality enhances economic performance regardless of developed or developing countries. Hence, this study anticipates that institutional quality is a good set of variables to be used in cushioning the negative impact of VAT on economic efficiency. This is because strong institutional qualities enhance resource diversion and allocation, which inevitably serve as the pre-condition for capital accumulation and economic efficiency. Thus, our second hypothesis is as follows:

H_2: VAT is more likely to enhance economic efficiency in countries that have high institutional quality.

In summary, VAT is a broad consumption tax which improves tax collection i.e. eliminates tax evasion. However, VAT is regressive in that the poor are more greatly affected, because they spend a greater proportion of their meagre income to pay for VAT than the wealthy. Hence, VAT also leads to tax inequality, which then affects economic efficiency adversely. However, here we merely examine the direct link between the VAT and economic efficiency, not specifically on tax efficiency or tax inequity, relying on the argument that VAT being a consumption-based tax is regressive in nature. We then extend the model by seeking to identify institutional quality factors i.e. country governance, that could mitigate the adverse effect of VAT on economic efficiency.

2. Methodology

2.1 Two-Step System GMM Estimation

The simplest methodology in econometric estimation, especially in dealing with long-run economic analysis, is the use of the Ordinary Least Square (OLS). However, the pooled OLS approach is unpopular because it may result in biased and inconsistent estimators arising from heteroscedasticity and endogeneity problems. This problem can be overcome using the fixed effects and the least squares dummy variable (LSDV) models. These models are widely used in macroeconomics analysis because they help solve the heteroscedasticity problem arising from unobserved country-specific time-invariant effects in the data. Nevertheless, this approach may not be appropriate for studying the dynamic concept in economic growth models, because the dependent variable is stripped off from the long-run variation.

The use of dynamic models is of interest in economic analysis, including analyses of consumption and production functions (Richard Blundell and Stephen Bond 2000; Blundell, Bond, and Frank Windmeijer 2000) and economic growth models (Ross Levine, Norman Loayza, and Thorsten Beck 2000). Nevertheless, cross-section estimates produce bias because of the endogeneity problem between the lagged dependent variables and the error-terms which disappear with large time dimensions but not with time-averaging. Hence, the use of the fixed effects model and LSDV may not be optimal to resolve the endogeneity problem of dynamic estimation.

We employ a system generalized method of moments (GMM) estimator of Manuel Arellano and Olympia Bover (1995) and Blundell and Bond (1998) to overcome the major caveats of the earlier models. The additional moment condition introduced in the system GMM performs better than the first-difference GMM because the introduction of the levels of equations yield good predictors for the endogenous variables even when the series are highly persistent, as found by Blundell and Bond (2000) and Blundell, Bond, and Windmeijer (2000). Therefore, to solve for heteroscedasticity, autocorrelation and endogeneity problems often present in the long-run growth models (based on endogenous growth models with lagged of economic efficiency and growth), we use the system GMM to obtain unbiased and consistent estimates.

We have further improved the system GMM model by employing a two-step approach to further restrict the number of instruments in the model. This approach avoids over-identification of the instrumental variables, which may lead to overfitting of the model (David Roodman 2006). The two-step approach prevents increases in the number of equations and parameters, even when the number of perfectly measured regressors increases. This is more efficient than the one-step GMM estimator. We use Sargan's test of over-identifying restrictions to assess the validity of our instrumental variables. The Sargan test statistics are asymptotically χ^2 under the null hypothesis, indicating that the instrumental variables are valid. Next, we construct the second-order autocorrelation test to check whether the error-terms are serially correlated. In this case, the error-terms can be first-order serially correlated but not in the second order. We impose the year dummy to reduce cross-sectional error dependence in the dynamic panels. In line with Bond (2002), we performed the additional detection of the dynamic estimate's validity to check whether the estimated coefficient of the lagged dependent

variable lies between the values obtained from Pooled Ordinary Least Squared (POLS) and Fixed Effect (FE) estimators. For brevity purposes, we excluded the POLS and FE estimations from this paper, as our discussion of results focuses on two-step system GMM.

2.2 Endogenous Growth Model

We first study the impact of value-added tax (VAT) on economic efficiency using the two-step system GMM presented in Equation (1), the base equation in our study.

$$Efficiency_{it}=\alpha_0+\alpha_1 Efficiency_{it-1}+\alpha_2 VAT/GDP_{it}+\alpha_3 GDP/Cap_{it-1}+\alpha_4 Inflation_{it} +\alpha_5 Spending_{it}+\alpha_6 Trade_{it}+\alpha_7 Literacy_{it}+\alpha_8 POPGrowth_{it}+\phi_t(year)_t+e_{it}, \quad (1)$$

where:

$Efficiency_{it}$= economic efficiency scores for country i at time t estimated using Data Envelopment Analysis (DEA);
VAT/GDP_{it} = value-added tax to gross domestic product for country i at time t;
GDP/Cap_{it-1} = the initial real gross domestic product (base year = 2010) *per capita* for country i^{th} at time t in natural logarithm;
$Inflation_{it}$ = inflation rate for country i at time t;
$Spending_{it}$ = government spending to GDP ratio for country i at time t;
$Trade_{it}$ = trade openness (ratio of exports plus imports to GDP) for country i at time t;
$Literacy_{it}$ = literacy rate for country i at time t;
$POPGrowth_{it}$ = population growth rate for country i at time t;
$(year)_t$= is the year dummy to control for cross-sectional correlation;
e_{it} = error-terms.

Equation (1) was formed with the modification of the endogenous growth model proposed by Barro (1984, 1990). Unlike the endogenous growth literature, we have excluded human and physical capital measured by labor force and country investment in capital stock respectively. This is because these two variables are the inputs in our production function, which estimates the efficiency score and in turn it is our dependent variable. If we include these two variables in the growth equation, we would violate the assumption of independent and identically distributed (i.i.d.) data.

The economic efficiency is our variable of interest, which indicates the ability of a country to maximize its output at a given level of inputs measured by non-parametric method, namely Data Envelopment Analysis (DEA). It shows the allocation of resources by the country. Our main independent variable is VAT collection to gross domestic product (GDP). Following Robert Carroll, Robert Cline, and Tom Neubig (2010), we use this measure as a substitute for the VAT rate due to unavailability of the rate in a time-series manner. This approach also enables us to accurately and precisely measure the income of the government generated using VAT as we expect higher VAT collection to be channeled out into productive sectors given the state of governance in the country.

The choice of control variables in this model is line with the endogenous growth model, where we control for the divergence of initial income from the economy's steady state using initial income level (GDP/CAP_{it-1}), the cost in the economy using inflation rate ($Inflation_{it}$), the ability of the government to spend to boost the economy level using government spending ($Spending_{it}$), the international trade that affects the allocation of resources using trade openness ($Trade_{it}$), the productivity in the economy using labor force quality ($Literacy_{it}$) and population growth ($POPGrowth_{it}$).

We expect VAT to reduce economic efficiency because it is a regressive tax which increases consumption cost. Thus, VAT dampens aggregate household consumption, which in turn lowers economic output. We further analyze whether the adverse effect of VAT can be mitigated by good country governance. To achieve this objective, we add interaction terms between institutional quality variable and VAT as presented in Equation (2) where Gov_{it} are the different measures of institutional quality obtained from the International Country Risk Group database (ICRG).

$$\begin{aligned} Efficiency_{it} = {} & \alpha_0 + \alpha_1 Efficiency_{it-1} + \alpha_2 VAT/GDP_{it} + \alpha_3 GOV_{it} + \alpha_4 GDP/Cap_{it-1} \\ & + \alpha_5 Inflation_{it} + \alpha_6 Spending_{it} + \alpha_7 Trade_{it} + \alpha_8 Literacy_{it} + \alpha_9 POPGrowth_{it} \\ & + \alpha_{10} VAT_{it} * GOV_{it} + \phi_t (year)_t + e_{it}. \end{aligned} \quad (2)$$

We expect α_{10} to be positive if higher institutional quality scores can mitigate the regressive impact of VAT and lead to better economic efficiency. Next, we analyze our models by controlling for: (1) financial development and (2) financial crisis, so as to obtain better insights into policy formulation. Financial development represents the extent of market integration due to dynamic globalization and liberalization. Following Andrea Bassanini, Stefano Scarpetta, and Philip Hemmings (2001) and Eimear Leahy, Seán Lyons, and Richard Tol (2011), our proxy for financial development is the private credit of deposit money banks provided to the private sector as a percentage of GDP.

Additionally, it is important to control for financial crises, because a financial crisis leads to external shocks which adversely impact economic development and distort economic policy implementation. Persistent shocks may also shift the production function, which in turn affects economic efficiency. Hence, we have included a financial crisis dummy following the definition of the World Financial Development Indicators, World Bank to capture the effects of financial crises.

2.3 Definition of Variables

We estimate economic efficiency for the sample countries using a non-parametric method, and measure efficiency based on ratios of observed output levels to the maximum level that could be obtained for given input levels. This maximum level constitutes the efficient frontier, forming a benchmark for measuring the relative efficiency of the observations. In this study, we use the non-parametric Data Envelopment Analysis (DEA) method based on R. D. Banker, A. Charnes, and W. W. Cooper (1984) to estimate inefficiency. DEA is a non-parametric linear programming-based technique designed to calculate relative efficiency based on the sample countries' efficient production frontier (Barbara Casu and Philip Molyneux 2003). Following George Emm

Halkos and Nickolaos G. Tzeremes (2009a, 2009b), we measure economic efficiency based on production functions with two inputs and one output.

The most efficient countries operate on the frontier, while those below the frontier are inefficient. According to Gary Koop, Jacek Osiewalski, and Mark F. J. Steel (2000), economic growth can occur if a country is able to avoid inefficient use of resources and move closer to the world's production frontier. We employ the output-oriented variable return to scale (VRS) model with the assumption that the government maximizes output for a given input amount. Equation (3) shows the model for calculating technical efficiency, based on Banker, Charnes, and Cooper (1984):

$$\begin{aligned} &max\,\theta \\ &subject\ to \\ &\sum_{j=1}^{n} \lambda_j x_{ij} \le x_{io} \qquad i=1,2,\ldots,m \\ &\sum_{j=1}^{n} \lambda_j y_{rj} \ge \theta y_{ro} \qquad r=1,2,\ldots,s \\ &\sum_{j=1}^{n} \lambda_j = 1 \\ &\lambda_j \ge 0 \qquad\qquad j=1,2,\ldots,n \end{aligned} \tag{3}$$

where DMU_0 (Decision Making Unit, i.e. in each given country) represents one of the n DMUs under evaluation, and x_{io} and y_{ro} are the i^{th} input and r^{th} output for DMU_0, respectively. λ_j are unknown weights, where $j = 1, 2, \ldots n$ which represents the number of DMUs. The optimal value of $\theta *$ represents the distance of each sector from the efficient frontier. Hence, the most technically efficient country has $\theta * = 1$ and more inefficient countries have $\theta * < 1$. The VRS model is a better representation of efficiency analysis because it assumes that output levels cannot be reduced proportionately with the input levels. By solving the mathematical programming problem in Equation (3), we obtain the technical efficiency scores for each country.

Following Halkos and Tzeremes (2009a, 2009b), we measure economic efficiency based on a production function, which has two inputs and one output, for the period of 1996-2006. The inputs are total labor force as a proxy for human capital and capital stock (in US dollar at current prices) as a proxy for physical capital. The output is GDP at market prices. Physical capital and human capital are widely used as inputs in the production function (see Stefan Föster and Magnus Henrekson 2001; Barro and Xavier Sala-i-Martin 2004). Robert E. Lucas (1988) further demonstrates the importance of capital accumulation in economic growth modelling. Capital stock is calculated by using the perpetual inventory method which treats the stock as an inventory and closely relates to capital accumulation in the long-run. The net capital stock is given in Equation (4):

$$K_t = K_{t-1} + I_{t-1} - D_{t-1}, \tag{4}$$

where k_t is the net capital stock at the beginning of period t, I_{t-1} is the gross investment in the previous period measured by gross capital formation and consumption of fixed capital for the previous period is given as D_{t-1}. By assuming a geometric depreciation at a constant rate of δ, Equation (4) can be rewritten as:

$$K_t = (1-\delta)K_{t-1} + I_{t-1}. \quad (5)$$

Repeatedly substituting this equation with capital stock at the beginning of the period will then lead to:

$$K_t = \sum_{i=0}^{\alpha}(1-\delta)^i I_{t-(i+1)}. \quad (6)$$

The depreciation rate is obtained from PWT 9.0 by Robert C. Feenstra, Robert Inklaar, and Marcel P. Timmer (2015) which provides information on the depreciation rate for 182 countries from 1950 to 2014.

In addition, the endogenous growth model also recognizes the permanent effects of increases in investment on the steady state of an economy (Bassanini, Scarpetta, and Hemmings 2001). According to Richard V. Adkisson and Mikidadu Mohammed (2014), human capital, measured by labor force, is expected have a positive impact on the steady state of economy and is one major input factor in the production function. We obtain the data for inputs and outputs from the World Development Indicator (WDI) database published by the World Bank.

Our main independent variable is VAT, which is the ratio of VAT collection to gross domestic product (GDP). Following Carroll, Cline, and Neubig (2010), we use this measure as a substitute for the VAT rate due to unavailability of the rate in a time-series manner. Consistent with the endogenous growth model, we control for the initial income level (GDP/CAP_{it-1}), inflation rate ($Inflation_{it}$), government spending ($Spending_{it}$), trade openness ($Trade_{it}$), labor force quality ($Literacy_{it}$) and population growth ($POPGrowth_{it}$). We do not control for labor force and investment in physical capital, because these variables are included in the estimation of production function so as to obtain the economic efficiency scores. Table 1 describes the variables used and the data sources.

The initial income level is the most crucial control variable to account for the divergence of initial income from an economy's steady state. It captures the convergence effects where countries with higher initial income level are expected to experience slower growth rates (Barro 1984; Föster and Henrekson 2001). This is consistent with the conditional convergence, which is highlighted in both the neoclassical growth and endogenous growth models (Barro and Sala-i-Martin 2004). Following Widmalm (2001), we use the lagged value of log real GDP *per capita* with base year 2005 as a proxy for the initial income level.

Next, we measure the country's inflation rate in percentage. We control for inflation, because inflationary episodes are harmful to the allocative efficiency of the price system, which reduces economic activity and retards economic (Friedman 1977; Fischer and Modigliani 1978). This is supported by Miki (2011), as high inflation reduces the rate of return on investment, delays or prevents the implementation of long-term projects and hence negatively impacts physical capital accumulation (Jones and Manuelli 1995).

Table 1 Definition of Variables

Variable	Definition	Sources	Empirical studies
Economic efficiency	Ability of the country to minimize its inputs to achieve the level of economic output	Author calculation	
Labor force	Labor force measured in person	WDI	Halkos and Tzeremes (2009a, 2009b)
Investment	Investment as a percentage of GDP	WDI	Halkos and Tzeremes (2009a, 2009b)
National output	Real GDP per capita with base year 2005	WDI	Halkos and Tzeremes (2009a, 2009b)
VAT	Value-added tax as a percentage of GDP	WDI	Carroll, Cline, and Neubig (2010)
Inflation rate	Inflation rate in percentage	WDI and International Financial Statistics (IFS)	Milton Friedman (1977), Stanley Fischer and Franco Modigliani (1978) Larry E. Jones and Rodolfo E. Manuelli (1993) Bumpei Miki (2011)
Government spending	Ratio of government spending to GDP	WDI	Sam Peltzman (1980) Barro (1990) James Gwartney, Randall Holcombe, and Robert Lawson (1998) Frida Widmalm (2001)
Trade openness	Sum of imports and exports as a share to GDP	WDI	Ann E. Harrison (1996), Bassanini, Scarpetta, and Hemmings (2001) Douglas A. Irwin and Marko Tervio (2002) Barro and Sala-i-Martin (2004)
Labor force quality	Literacy rate in percentage	WDI	Barro (1991) William E. Cashin (1995)
Population growth	Natural logarithm of population of the current year minus the natural logarithm of population from previous year	WDI	Widmalm (2001), Matthew Odedokun (2001), Jing Xing (2011) Arnold et al. (2011) Adkisson and Mohammed (2014)

Source: Authors' compilation.

The measure for government spending is the ratio of government spending to GDP, which directly affects the production function according to the endogenous growth model (Barro 1990). This relationship may be either positive or negative, depending on whether the government allocates expenditure into productive or unproductive sectors. A positive effect is expected when the expenditure is channeled into productive sectors, such as infrastructure, healthcare and education, which influence the rate of investment in physical capital and increase the productivity of human capital (Peltzman 1980; Widmalm 2001). On the other hand, James Gwartney, Randall Holcombe, and Robert Lawson (1998) have argued that excessively large government spending may crowd out resources from the private sector and is harmful to economic growth if it is allocated into unproductive sectors.

We measure trade openness by the sum of imports and exports as a share to GDP. As suggested by the endogenous growth model, open economies record faster economic growth due to technology spillover effects (Barro and Sala-i-Martin 2004). This has been demonstrated empirically by the studies of Harrison (1996), Irwin and Tervio (2002), who found a positive relationship between trade openness and economic growth. Thus, we expect it will also enhance economic efficiency arising from foreign investors' diffusion of more advanced technologies. Additionally, trade openness is used to capture market size and competitive pressures (Bassanini, Scarpetta, and Hemmings 2001) which are the crucial factors to foster economic efficiency.

Quality of the labor force is also crucial in affecting the level of economic efficiency. In this case, instead of using the average number of years of schooling, which has little time variation, we use literacy rate to measure the country's labor force quality. This measure gauges the country's education level in controlling for a steady-state economy (Cashin 1995). Education level is an important control variable because a higher level leads to higher disposable income and better labor force knowledge that improve the economy's productivity (Barro 1991).

Finally, we control for population growth using the natural logarithm of population of the current year minus that of the preceding year. Population growth is used to control for change in the state's labor market (Adkisson and Mohammed 2014). A higher population growth may reduce the marginal productivity of labor and hence contributes to lower economic efficiency (Odedokun 2001; Widmalm 2001; Arnold et al. 2011; Xing 2011). Table 1 summarizes the definitions of the research variables.

In this study, we also examine the role of institutional quality in influencing the relationship between VAT and economic efficiency. Of particular interest to us is country governance quality, because according to Bird, Jorge Martinez-Vazquez, and Benno Torgler (2008), good governance is a pre-determinant of a good tax structure and efficiency, which in turn affects the ability of the governments to fulfil their social obligations. This contributes to higher productivity and economic efficiency. Furthermore, stronger country governance enables the government to work efficiently in protecting private property and the environment, encouraging more optimist business activities, supporting macroeconomic stability and effective management of social conflicts that are crucial for sustainable economic growth (Rodrik 2000). In this study, we expect that country governance would play a crucial factor to mitigate the adverse effect of VAT on economic efficiency. We chose bureaucracy quality, corruption control, government stability and political risk to represent a set of country governance factors. We take this approach because the stability of a country is a pre-condition for capital accumulation and economic efficiency. We obtained the country governance variables from the Country Data Online by Political Risk Services Group (2018)[1]. Table 2 defines the country governance variables, consisting of country governance and risk factors used in our study.

Table 2 Definitions of Country Governance

Variable	Definition	Scale
Country governance:		
Bureaucracy quality	Measures the institutional strength and quality of the bureaucracy to minimize the adverse effects when there is a change in government. Bureaucracy is independent from political pressure when the countries are at low risk. A higher scale indicates high bureaucratic quality.	0 to 4
Corruption	Measures the degree of corruption within the political system which is a threat to foreign investment. It creates an adverse effect on the economic and financial environment, reducing the efficiency of the government and business because it enables people to assume positions of power through patronage rather than ability, which results in political instability. A higher scale indicates lower corruption.	0 to 6

[1] **Political Risk Services Group.** 2018. Country Data Online. https://www.prsgroup.com/explore-our-products/countrydata-online/ (accessed January 07, 2018).

Government stability	Measures the ability of the government to successfully implement the policies and programs as declared. The risk rating is based on the sum of three subcomponents that is government unity, legislative strength and popular support. A higher rating is assigned for better government stability.	0 to 12
Political risk	An average score for political stability of a country as compared to other countries by assessing risk points for each of the components that comprise government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability and bureaucracy quality. Risk ratings range from a high of 100 (least risk) to a low of 0 (highest risk).	0 to 100

Source: Authors' compilation.

2.4 Data and Sample

Our study involves a huge data set of 115 countries for the period 1984 to 2014. We employ unbalanced panel data to capture the maximum number of countries in the sample for the representative features in policy implication. We obtain the macroeconomic data from Thomson Datastream, while the data for country governance are from the ICRG database. We further categorized our sample countries into high corporate tax, medium corporate tax and low corporate tax countries as we suspect VAT creates extra burden to countries with high tax rate if the government fails to utilize the collection efficiently. Further corporate tax rate is more relevant than the personal income tax rate as the VAT affects consumers through the production channel rather than from the end-user products. In this context, we have divided our sample into high-tax (corporate tax rate of more than 30%), medium-tax (corporate rate between 20% and 30%) and low-tax categories (corporate tax rate of less than 20%) using dummy variables[2].

Dummy variables are used to prevent the loss of a number of observations which are crucial in the estimation of GMM that requires a huge dataset. We anticipate that the impact of VAT differs depending on the level of corporate tax rates. According to Charles L. Ballard, John Karl Scholz, and John B. Shoven (1987), corporate tax rates is mainly held to reduce the overall rates of return and affecting the capital accumulation which inevitably affects the economic efficiency. Hence, we believe that higher VAT together with higher corporate tax rate could be translated into an extra burden to the consumers if not handled properly. Hence, the interaction between VAT and corporate tax rate should be examined (Stephen P. Dresch, An-loh Lin, and D. K. Stout 1977). Therefore, we aim to seek for a better solution by identifying important country governance factors that could mitigate the negative impact of VAT, and subsequently attain higher economic growth and development. We have adopted the definitions of high-tax countries, medium-tax countries and low tax countries from the Corporate Income Tax Rates Report 2015 of tax foundation and the KPMG[3] group's corporate tax rates table.

Table 3 shows the mean values of the variables. We include a full summary of statistics in Appendix Table A4.

[2] Refer Appendix Table A1-A3 for the list of countries in each category

[3] KPMG refers to the merge entity between Peat Marwick International (PMI) and Klynveld Main Goerdeler (KMG), a global audit firm.

Table 3 Mean Values of the Variables

Variable	Full sample *N* = 2609	High-tax countries *N* = 862	Medium-tax countries *N* = 1316	Low-tax countries *N* = 431
Dependent variable:				
Economic efficiency (%)	51.63	50.14	51.32	55.55
Variable of interest:				
VAT/ GDP (%)	7.57	6.04	8.03	9.23
Country governance:				
Bureaucracy quality	2.39	2.05	2.55	2.57
Corruption	3.11	2.69	3.40	3.06
Government stability	8.00	7.78	8.10	8.15
Political risk	68.14	63.00	69.88	73.09
Control variables:				
Real GDP growth (base year 2005, %)	3.62	3.68	3.64	3.47
Inflation rate (%)	48.27	97.86	17.08	44.31
Government spending (%) to GDP	28.06	24.03	29.00	33.26
Trade openness	0.80	0.65	0.78	1.15
Labor force quality (literacy rate %)	85.14	75.47	87.32	97.82
Population growth (%)	1.21	1.78	1.13	0.28
Developed countries (%)		16.67	35.19	65.00

Notes: Refer to Appendix Table A4 for the full summary statistics.

Source: Authors' calculations.

The full sample shows that overall, our sample countries are relatively inefficient, with an average overall efficiency score of 51.63%. This means that the countries can further improve their output of 48.37% given the labor and capital stock of the countries. We also find that 83.3% of the high-tax countries consist of developing countries. This shows that developing countries with VAT are also high-tax countries. This phenomenon is alarming because of the tax burden that such nations have to bear given their low income, which might lead to adverse economic growth and lower economic efficiency. This is consistent with the average efficiency scores of 50.14%, which is the lower than the scores of the medium-tax and low-tax countries. On the other hand, low-tax countries appear to be the most relative economic efficient, with an average efficiency score of 55.55%. The higher economic efficiency may due to most countries in this category are also in the developed economies group. This finding is consistent with the theoretical view in which we find that developed countries have relatively higher economic efficiency scores than the developing countries. In addition, lowering corporate tax with the implementation of VAT may result in better outcomes because income taxes are found to have more detrimental effect on economy than VAT (Johansson et al. 2008).

In terms of institutional quality, we observe that on average and overall, low-tax countries have higher governance quality. This finding implies that low-tax countries (mainly comprising mature and stable western democracies) have a more efficient public service, lower levels of corruption, a more stable government and a more conducive and attractive investment climate than developing countries which are still grappling with the issues of political and economic instability. We also note that there is a huge difference between the low-tax countries in terms of political risk, which is

not surprising because the latter mainly consists of countries in the developed region. In sum, our findings show that low-tax countries have a relatively stronger institutional quality, which we believe may have a significant influence in the way that VAT affects economic efficiency. We expect that the stronger institutional quality increases economic efficiency in low-tax countries compared to other countries. Hence, our main empirical analysis examines whether there is a differential influence of the institutional quality on the effect of VAT and economic efficiency in different tax regimes.

The correlation matrix for the independent variables is presented in Table 4. There is no serious multicollinearity in the variables employed as observed from the correlation matrix.

Table 4 Correlation Matrix

	VATGDP	BQ	CORR	GS	PR	GDP growth (-1)	Inflation	Spending	lnopen	lnlit	popgrowth	Crisis
VATGDP	1.000											
BQ	-0.109	1.000										
CORR	-0.131	0.697	1.000									
GS	0.015	0.029	0.020	1.000								
PR	-0.035	0.772	0.688	0.314	1.000							
GDPgrowth (-1)	-0.015	-0.116	-0.158	0.134	-0.055	1.000						
Inflation	-0.011	-0.068	0.041	-0.091	-0.117	-0.158	1.000					
Spending	0.016	0.505	0.476	-0.013	0.514	-0.226	-0.024	1.000				
lnopen	0.113	0.182	0.068	0.142	0.307	0.042	-0.057	0.201	1.000			
lnlit	0.024	0.458	0.316	0.040	0.486	-0.094	-0.021	0.345	0.257	1.000		
popgrowth	-0.123	-0.368	-0.255	-0.078	-0.490	0.125	0.052	-0.448	-0.211	-0.602	1.000	
Crisis	-0.056	0.065	0.093	-0.099	0.045	-0.216	0.096	0.115	-0.029	0.071	-0.057	1.000

Notes: VATGDP = percentage of value-added taxes to gross domestic product, BQ = bureaucratic quality index, CORR = corruption index, GS = government stability index, PR = political risk index, GDPgrowth(-1) = lagged of GDP growth measured in percentage, inflation = inflation rate measured in percentage, spending = total government expenditure/GDP in percentage, lnopen = natural logarithm of trade openness, lnlit = natural logarithm for literacy rate, popgrowth = population growth measured in percentage, Crisis = dummy variable that takes a value of 1 for countries which experienced a financial crisis based on the World Bank's definition of banking crisis.

Source: Authors' calculations.

3. Results and Discussion

3.1 Full Sample

Our main objective is to examine the impact of VAT on economic efficiency for which we hypothesize that VAT reduces the economic efficiency of a country. Table 5 shows the two-step system GMM regression results for the full sample.

Table 5 Estimated Results for the Full Sample

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Eff (-1)	0.511*** (0.004)	0.494*** (0.003)	0.373*** (0.002)	0.746*** (0.006)	0.602*** (0.028)
VATGDP	-1.237*** (0.072)	-0.921*** (0.078)	-1.272*** (0.040)	-4.311*** (0.141)	-6.559*** (1.306)
BQ	-	11.906*** (0.529)	-	-	-
CORR	-	-	9.383*** (0.251)	-	-

GS	-	-	-	6.390*** (0.215)	-
PR	-	-	-	-	0.325** (0.147)
VATGDP*BQ	-	0.770*** (0.045)	-	-	-
VATGDP*CORR	-	-	0.898*** (0.022)	-	-
VATGDP*GS	-	-	-	0.646*** (0.018)	-
VATGDP*PR	-	-	-	-	0.089*** (0.021)
GDPgrowth (-1)	0.562*** (0.012)	0.652*** (0.017)	0.480*** (0.010)	0.782*** (0.024)	0.338*** (0.077)
Inflation	-0.008*** (0.000)	-0.008*** (0.000)	-0.004*** (0.000)	-0.006*** (0.000)	-0.027*** (0.006)
Spending	1.389*** (0.027)	1.014*** (0.022)	0.131*** (0.015)	1.017*** (0.016)	0.107* (0.059)
lnopen	-9.363*** (0.443)	-6.010*** (0.638)	-1.074** (0.481)	-8.061*** (0.518)	-4.772*** (1.409)
lnlit	14.912*** (1.272)	10.407*** (0.986)	3.459*** (0.588)	1.594 (1.145)	-0.254 (3.549)
popgrowth	-2.177*** (0.358)	-0.922*** (0.273)	-3.118*** (0.090)	-2.020*** (0.191)	-3.240*** (0.810)
Crisis	-31.446*** (0.314)	-32.229*** (0.737)	-2.466*** (0.320)	-21.734*** (0.426)	-1.427 (1.145)
Constant	-65.462*** (5.156)	-66.133*** (4.260)	2.429 (2.557)	-65.882*** (6.172)	-52.975*** (16.353)
Year dummy	Included	Included	Included	Included	Included
Model fits:					
AR(1)	-6.08***	-6.09***	-6.20***	-6.48***	-2.62***
AR(2)	0.98	0.58	1.58	1.48	1.33
Hansen J-test	107.15 (0.451)	105.78 (0.433)	107.39 (0.289)	102.54 (0.411)	29.11 (0.876)
Instruments	116	116	112	112	51
Number of observations	2493	2493	2493	2493	2493

Notes: The table provides the coefficients of system GMM based on a two-step estimator to correct for heteroskedasticity for the VAT countries from 1984-2014. The dependent variable - estimated efficiency scores (Eff) - is based on the DEA model. VATGDP = percentage of value-added taxes to gross domestic product, Model (1) estimates the basic growth model, Model (2) estimates BQ = bureaucratic quality index, Model (3) estimates CORR = corruption index, Model (4) estimates GS = government stability index, Model (5) estimates PR = political risk index, VATGDP*BQ = interaction term between VAT and bureaucratic quality, VATGDP*CORR = interaction term between VAT and corruption index, VATGDP*GS = interaction term between VAT and government stability, VATGDP*PR = interaction term between VAT and political risk. Standard error of the coefficient is in parentheses. For the Sargan test, the values in parentheses refer to the *p*-values. AR1: Arellano-Bond test that averages auto-covariance in residuals order 1 is 0. AR2: Arellano-Bond test that averages auto-covariance in residuals order 2 is 0. Control variables: GDPgrowth(-1) = lagged of GDP growth measured in percentage, inflation = inflation rate measured in percentage, spending = total government expenditure/GDP in percentage, lnopen = natural logarithm of trade openness, lnlit = natural logarithm for literacy rate, populationgrowth = population growth measured in percentage, Crisis = dummy variable that takes a value of 1 for countries which experienced a financial crisis based on the World Bank's definition of banking crisis and Year dummy included to control for cross-sectional correlation. The governance indices are obtained from the ICRG database. * denotes significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Source: Authors' calculations.

The result of Model 1 indicates that VAT has a negative relationship with economic efficiency at the 1% significance level, which supports our first hypothesis. This finding is consistent with the notion that VAT is regressive and in this case, it adversely affects economic efficiency. In this instance, our findings corroborate the argument of Maximilian Baylor and Louis Beauséjour (2004) that the negative effect of consumption tax on after-tax real wage and capital formation prompted economic agents to reallocate resources, in turn affecting both the production frontier of the economy and long-run economic growth.

Next, we analyze the moderating effect of country governance on the link between VAT and economic efficiency. Consistent with our expectations, all country governance factors increase economic efficiency. This result corroborates the idea that country governance positively affects economic growth (Chong and Gradstein 2007; Samimi and Salehani 2010). We have also added the interaction terms of VAT and each country governance variable as shown in Model 2 to Model 5 to test the moderating effect. As predicted, we observe that bureaucratic quality, corruption control, government stability and political risk ratings positively moderate the link between VAT and economic efficiency. This indicates that better country governance reduces the regressive effect of VAT. This is consistent with the findings of Chong and Gradstein (2007). They argue that high quality of enforcement reduces the detrimental effects of VAT on the economic growth. Our results support this notion in which we observe that all the country governance factors seem to enhance economic efficiency in the light of the adverse effect of VAT. Our result is also consistent with the findings of McDonald and Jumu (2008) and Samimi and Salehani (2010). They proposed that institutional quality provides the linkage between taxation and economic growth.

Consequently, we expect that country governance is a good set of variables to be used in cushioning the negative impact of VAT on economic efficiency. This is because good country governance enhances resource diversion and allocation, which inevitably serve as the pre-condition for capital accumulation and economic efficiency. The results are not only highly statistically significant but also of economic importance. For example, an increase in VAT revenue and corruption control by one (sample) standard deviation increases economic efficiency by 63.72% points. Corruption control has the greatest moderating influence in the link between VAT and economic efficiency. Our results further confirm the findings of prior studies (see Chong and Calderón 2000; Bird, Martinez-Vazquez, and Torgler 2008).

3.2 High-Tax Countries

We further segregate our sample based on the country's corporate tax rate in order to determine the reaction of the countries with different corporate tax bracket on the implementation of VAT. We suspect that the differences in tax rates affect economic efficiency as higher tax may hinder the accumulation of private returns (William Easterly and Sergio Rebelo 1993). Higher tax reduces the rewards to taxpayers; thus distorting the incentives for individuals and corporations for investment. The tax situation may worsen with the implementation of VAT because it further adds to the burden of taxpayers. Therefore, we expect higher-tax countries may suffer more with the implementation of VAT. Our results in Tables 6, 7 and 8 generally confirmed our

expectation that VAT is regressive, which reduces economic efficiency. Our result is in line with Johansson et al. (2008) in which they find that consumption tax as the third tax category (after corporate and personal taxes) is the most harmful to economic growth in OECD countries. Furthermore, our results are also consistent with the findings of Olu D. Ajakaiye (1999) and Qamruz Zaman, Okasha, and Muhammad Iqbal (2012).

Table 6 Estimated Results for High Corporate Tax Rate Countries

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Eff (-1)	0.503*** (0.005)	0.487*** (0.005)	0.451*** (0.006)	0.395*** (0.015)	0.479*** (0.005)
VATGDP	-1.892*** (0.112)	-0.787*** (0.082)	-2.399*** (0.132)	-2.436*** (0.256)	-1.144*** (0.063)
Dummy high	-27.865*** (1.054)	-17.400*** (1.477)	-58.565*** (3.099)	-32.881*** (3.887)	-20.851*** (1.291)
VATGDP * dummy high	3.557*** (0.134)	-	-	-	-
BQ	-	2.206*** (0.624)	-	-	-
CORR	-	-	8.956*** (0.419)	-	-
GS	-	-	-	1.289** (0.521)	-
PR	-	-	-	-	0.539*** (0.037)
VATGDP * dummy high * BQ	-	1.358*** (0.072)	-	-	-
VATGDP * dummy high * CORR	-	-	2.932*** (0.135)	-	-
VATGDP * dummy high * GS	-	-	-	0.727*** (0.044)	-
VATGDP * dummy high * PR	-	-	-	-	0.059*** (0.002)
GDPgrowth (-1)	0.474*** (0.022)	0.388*** (0.019)	0.219*** (0.025)	0.216*** (0.073)	0.316*** (0.022)
Inflation	-0.008*** (0.001)	-0.008*** (0.001)	-0.005*** (0.001)	-0.009*** (0.002)	-0.007*** (0.001)
Spending	1.351*** (0.030)	1.218*** (0.038)	1.619*** (0.073)	1.698*** (0.094)	1.122*** (0.017)
lnopen	-8.317*** (0.571)	-4.621*** (0.407)	-9.827*** (0.674)	-5.764** (2.271)	-6.279*** (0.322)
lnlit	12.995*** (1.398)	9.691*** (1.569)	9.370*** (1.632)	12.654*** (3.794)	10.629*** (0.949)
popgrowth	-1.952*** (0.413)	-0.010 (0.353)	-3.385*** (0.364)	0.029 (1.125)	2.040*** (0.442)
Crisis	-34.388*** (0.953)	-34.986*** (0.444)	-41.253*** (1.100)	-41.837*** (1.160)	-32.844*** (0.670)
Constant	-48.609*** (5.513)	-46.427*** (5.698)	-4.375 (6.967)	-60.151*** (20.108)	-79.925*** (5.938)
Year dummy	Included	Included	Included	Included	Included
Model fits					

AR(1)	-6.07***	-6.04***	-5.81***	-5.88***	-6.17***
AR(2)	0.89	0.92	0.85	0.67	1.04
Hansen J-test	103.97 (0.483)	105.67 (0.409)	102.40 (0.498)	87.04 (0.182)	104.32 (0.445)
Instruments	116	116	116	89	116
Number of observations	2493	2493	2493	2493	2493

Notes: The table provides the coefficients of system GMM based on a two-step estimator to correct for heteroskedasticity for the VAT countries from 1984-2014. The dependent variable - estimated efficiency scores (Eff) - is based on the DEA model. VATGDP = percentage of value-added taxes to gross domestic product, Dummy high = dummy variable that takes value of 1 for countries with high corporate tax rate (>30%), VATGDP*Dummy high = interaction term between VAT and countries with high corporate tax rate, Model (1) estimates the basic growth model, Model (2) estimates BQ = bureaucracy quality index, Model (3) estimates CORR = corruption index, Model (4) estimates GS = government stability index, Model (5) estimates PR= political risk index, VATGDP*BQ = interaction term between VAT and bureaucracy quality, VATGDP*CORR = interaction term between VAT and corruption index, VATGDP*GS = interaction term between VAT and government stability, VATGDP*PR = interaction term between VAT and political risk, VATGDP*Dummy high*BQ = interaction term between VAT, dummy for high corporate tax rate and bureaucracy quality, VATGDP*Dummy high*CORR = interaction term between VAT, dummy for high corporate tax rate and corruption index, VATGDP*Dummy high*GS = interaction term between VAT, dummy for high corporate tax rate and government stability, VATGDP*Dummy high*PR = interaction term between VAT, dummy for high corporate tax rate and political risk, VATGDP*Dummy high*FR = interaction term between VAT, dummy for high corporate tax rate and financial risk, Standard error of coefficient is in parentheses. For the Sargan test, the values in parentheses refer to the *p*-values. AR1: Arellano-Bond test that averages auto-covariance in residuals order 1 is 0. AR2: Arellano-Bond test that averages auto-covariance in residuals order 2 is 0. Control variables: GDPgrowth(-1) = lagged of GDP growth measured in percentage, inflation = inflation rate measured in percentage, spending = total government expenditure/GDP in percentage, lnopen = natural logarithm of trade openness, lnlit = natural logarithm for literacy rate, population growth = population growth measured in percentage, Crisis = dummy variable that takes a value of 1 for countries which experienced a financial crisis based on the World Bank's definition of banking crisis and Year dummy included to control for cross-sectional correlation. The governance indices are obtained from the ICRG database. * denotes significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Source: Authors' calculations.

Surprisingly, we have found that VAT in high-tax rate countries improves economic efficiency which is statistically significant at 1% level. The positive influence may be due to increase in the government revenue to be allocated for advancing the welfare of the society in the countries that previously experienced inefficient tax collection. According to Keen and Smith (2006), VAT has been the most significant tax policy to enhance tax efficiency and raise revenues especially in developing economies. On the other hand, VAT reduces the economic efficiency in medium-tax and low-tax countries and it is statistically significant at the 1% level. The impact on a medium-tax country is higher as compared to a low-tax country, confirming that implementation of VAT further ads to the burden of taxpayers.

We further anticipate that the impact of VAT in the sample countries based on the different corporate tax regimes can be mitigated by strong country governance. To confirm our suspicion, we estimate the model of economic efficiency for each corporate tax group using bureaucracy quality, corruption control, government stability and political risk stability that represent institutional quality. The results of the interaction terms shown in Model (2) to Model (5) confirmed that country governance in high-tax countries reduce the regressive effect of VAT on economic efficiency in high-tax countries. Our findings support the argument of Chong and Gradstein (2007) where high quality of enforcement creates less detrimental effect for growth in terms of implementation of tax policy. In this case, stronger country governance makes taxation

more affordable (Chong and Gradstein 2007) even in countries with higher tax rates. Therefore, our results imply that countries with high corporate tax should focus on enhancing their country governance in order to gain optimally from VAT despite inducing the burden to their nations.

3.3 Medium- and Low-Tax Countries

The estimation results for medium- and low-tax countries are shown in Tables 7 and 8. We anticipate that improvement in the institutional quality could alleviate the negative impact of VAT in these countries. This is because VAT remains a popular tax policy in most medium- and low-tax countries due to the inefficiency in tax collection. Hence, implementation of VAT could not be avoided to generate government revenue for better economic development and growth. To confirm our predictions, we have run the subsequent models by introducing the interaction terms between institutional qualities on VAT collection for the medium- and low-tax countries.

Table 7 Estimated Results for Medium Corporate Tax Rate Countries

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Eff (-1)	0.503*** (0.006)	0.472*** (0.004)	0.460*** (0.006)	0.403*** (0.015)	0.736*** (0.006)
VATGDP	-0.379*** (0.091)	-0.315*** (0.081)	-0.263*** (0.056)	-0.906*** (0.233)	-0.707*** (0.061)
Dummy medium	11.569*** (1.384)	7.253*** (1.767)	23.918*** (1.327)	24.658*** (4.745)	1.691** (0.707)
VATGDP * dummy medium	-2.082*** (0.160)	-	-	-	-
BQ	-	10.023*** (0.358)	-	-	-
CORR	-	-	3.729*** (0.155)	-	-
GS	-	-	-	5.823*** (0.490)	-
PR	-	-	-	-	0.346*** (0.016)
VATGDP * dummy medium * BQ	-	-1.193*** (0.079)	-	-	-
VATGDP * dummy medium * CORR	-	-	-1.270*** (0.046)	-	-
VATGDP * dummy medium * GS	-	-	-	-0.656*** (0.059)	-
VATGDP * dummy medium * PR	-	-	-	-	0.008*** (0.001)
GDPgrowth (-1)	0.608*** (0.023)	0.586*** (0.025)	0.689*** (0.018)	0.435*** (0.078)	0.695*** (0.023)
Inflation	-0.007*** (0.000)	-0.008*** (0.001)	-0.006*** (0.001)	-0.010*** (0.002)	-0.005*** (0.000)
Spending	1.417 (0.026)	1.165*** (0.027)	1.586*** (0.035)	1.831*** (0.123)	0.830*** (0.027)
Inopen	-5.745*** (0.501)	0.553 (0.664)	-8.382*** (0.418)	-4.627* (2.487)	-7.550*** (0.359)
Inlit	12.209*** (1.453)	5.941*** (0.978)	10.867*** (1.542)	6.433 (5.044)	7.274*** (0.918)

popgrowth	-2.431*** (0.343)	-1.173*** (0.315)	-2.798*** (0.345)	-1.689 (1.253)	0.751*** (0.269)
Crisis	-33.065*** (0.704)	-34.063*** (1.121)	-32.422*** (0.812)	-42.895*** (1.370)	-25.747*** (0.938)
Constant	-56.607*** (6.374)	-43.683*** (4.324)	-69.993*** (7.057)	-86.914*** (24.675)	-63.117*** (4.379)
Year dummy	Included	Included	Included	Included	Included
Model fits					
AR(1)	-6.20***	-6.09***	-5.81***	-5.86***	-6.31***
AR(2)	1.02	0.58	0.77	-0.14	1.19
Hansen J-test	103.83 (0.486)	104.98 (0.427)	104.87 (0.430)	89.43 (0.139)	101.89 (0.401)
Instruments	116	116	116	89	112
Number of observations	2493	2493	2493	2493	2493

Notes: The table provides the coefficients of system GMM based on a two-step estimator to correct for heteroskedasticity for the VAT countries from 1984-2014. The dependent variable - estimated efficiency scores (Eff) - is based on the DEA model. VATGDP = percentage of value-added taxes to gross domestic product, Dummy medium = dummy variable that takes value of 1 for countries with medium corporate tax rate (20%-30%), VATGDP*Dummy high = interaction term between VAT and countries with high corporate tax rate, Model (1) estimates the basic growth model, Model (2) estimates BQ = bureaucracy quality index, Model (3) estimates CORR = corruption index, Model (4) estimates GS = government stability index, Model (5) estimates PR = political risk index, VATGDP*BQ = interaction term between VAT and bureaucracy quality, VATGDP*CORR = interaction term between VAT and corruption index, VATGDP*GS = interaction term between VAT and government stability, VATGDP*PR = interaction term between VAT and political risk, VATGDP*Dummy medium*BQ = interaction term between VAT, dummy for medium corporate tax rate and bureaucracy quality, VATGDP*Dummy medium*CORR = interaction term between VAT, dummy for medium corporate tax rate and corruption index, VATGDP*Dummy medium*GS = interaction term between VAT, dummy for medium corporate tax rate and government stability, VATGDP*Dummy medium*PR = interaction term between VAT, dummy for medium corporate tax rate and political risk, VATGDP*Dummy medium*FR = interaction term between VAT, dummy for medium corporate tax rate and financial risk, Standard error of coefficient is in parentheses. For the Sargan test, the values in parentheses refer to the *p*-values. AR1: Arellano-Bond test that averages auto-covariance in residuals order 1 is 0. AR2: Arellano-Bond test that averages auto-covariance in residuals order 2 is 0. Control variables: GDPgrowth(-1) = lagged of GDP growth measured in percentage, inflation = inflation rate measured in percentage, spending = total government expenditure/GDP in percentage, lnopen = natural logarithm of trade openness, lnlit = natural logarithm for literacy rate, population growth = population growth measured in percentage, Crisis = dummy variable that takes a value of 1 for countries which experienced a financial crisis based on the World Bank's definition of banking crisis and Year dummy included to control for cross-sectional correlation. The governance indices are obtained from the ICRG database. * denotes significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Source: Authors' calculations.

Table 8 Estimated Results for Low Corporate Tax Rate Countries

Variable	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
Eff (-1)	0.509*** (0.004)	0.520*** (0.090)	0.503*** (0.004)	0.197*** (0.004)	0.796*** (0.004)
VATGDP	-0.754*** (0.079)	-1.518** (0.637)	-0.536*** (0.091)	-2.519*** (0.046)	-0.246*** (0.062)
Dummy low	24.095*** (1.402)	35.319* (18.453)	38.090*** (1.239)	1254.397*** (475.734)	16.498*** (1.381)
VATGDP * dummy low	-1.896*** (0.183)	-	-	-	-
BQ	-	-2.746 (2.638)	-	-	-
CORR	-	-	0.471* (0.260)	-	-

GS	-	-	-	0.141* (0.083)	-
PR	-	-	-	-	0.648*** (0.037)
VATGDP * dummy low * BQ	-	-2.520*** (0.748)	-	-	-
VATGDP * dummy low * CORR	-	-	-1.408*** (0.059)	-	-
VATGDP * dummy low * GS	-	-	-	0.030* (0.018)	-
VATGDP * dummy low * PR	-	-	-	-	-0.026*** (0.003)
GDPgrowth (-1)	0.473*** (0.013)	1.073* (0.577)	0.382*** (0.018)	0.536*** (0.020)	0.398*** (0.019)
Inflation	-0.008*** (0.000)	-0.024 (0.040)	-0.008*** (0.000)	-0.006*** (0.000)	-0.007*** (0.000)
Spending	1.420*** (0.035)	0.263 (0.263)	1.457*** (0.039)	0.986*** (0.022)	1.081*** (0.033)
lnopen	-8.310*** (0.521)	6.600 (5.257)	-12.688*** (0.548)	-59.473*** (0.853)	-7.694*** (0.528)
lnlit	16.770*** (1.313)	-19.744 (12.510)	16.967*** (1.866)	45.871*** (4.672)	17.032*** (1.030)
popgrowth	-1.233*** (0.336)	-0.927 (2.465)	-0.882* (0.487)	-16.582*** (0.885)	-2.671*** (0.457)
Crisis	-32.827*** (0.398)	-11.111 (8.710)	-29.242*** (0.321)	-6.442*** (0.471)	-30.548*** (0.611)
Constant	-78.829*** (5.495)	-88.460 (57.426)	-85.047*** (8.018)	-91.159*** (74.081)	-121.825*** (5.376)
Year dummy	Included	Included	Included	Included	Included
Model fits					
AR(1)	-6.07***	-5.85***	-5.93***	-5.84***	-6.20***
AR(2)	0.94	0.15	0.54	-0.04	1.16
Hansen J-test	103.50 (0.495)	103.84 (0.486)	103.62 (0.464)	111.75 (0.284)	103.63 (0.464)
Instruments	116	116	116	116	116
Number of observations	2493	2493	2493	2493	2493

Notes: The table provides the coefficients of system GMM based on a two-step estimator to correct for heteroskedasticity for the VAT countries from 1984-2014. The dependent variable - estimated efficiency scores (Eff) - is based on the DEA model. VATGDP = percentage of value-added taxes to gross domestic product, Dummy low = dummy variable that takes value of 1 for countries with low corporate tax rate (<20%), VATGDP* Dummy high = interaction term between VAT and countries with high corporate tax rate, Model (1) estimates the basic growth model, Model (2) estimates BQ = bureaucracy quality index, Model (3) estimates CORR = corruption index, Model (4) estimates GS = government stability index, Model (5) estimates PR = political risk index, VATGDP*BQ = interaction term between VAT and bureaucracy quality, VATGDP*CORR = interaction term between VAT and corruption index, VATGDP*GS = interaction term between VAT and government stability, VATGDP*PR = interaction term between VAT and political risk, VATGDP*Dummy low*BQ = interaction term between VAT, dummy for low corporate tax rate and bureaucracy quality, VATGDP*Dummy low *CORR = interaction term between VAT, dummy for low corporate tax rate and corruption index, VATGDP*Dummy low *GS = interaction term between VAT, dummy for low corporate tax rate and government stability, VATGDP*Dummy low *PR = interaction term between VAT, dummy for low corporate tax rate and political risk, VATGDP*Dummy low *FR = interaction term between VAT, dummy for low corporate tax rate and financial risk, Standard error of coefficient is in parentheses. For the Sargan test, the values in parentheses refer to the *p*-values. AR1: Arellano-Bond test that averages auto-covariance in residuals order 1 is 0. AR2: Arellano-Bond test that averages auto-covariance in residuals order 2 is 0. Control variables: GDPgrowth(-1) = lagged of GDP growth measured in percentage, inflation = inflation rate measured in percentage, spending = total government expenditure/GDP in percentage, lnopen = natural logarithm of trade openness, lnlit = natural logarithm for literacy rate, population growth = population growth measured in percentage, Crisis = dummy variable that takes a value of 1 for countries which experienced a financial crisis based on the World Bank's definition of banking crisis and Year dummy included to control for cross-sectional correlation.

The governance indices are obtained from the ICRG database. * denotes significance at the 10% level; ** significance at the 5% level; *** significance at the 1% level.

Source: Authors' calculations.

The results shown in Tables 7 and 8 suggest that country governance has a rather weak mitigating effect. The negative impact of VAT collection remains negative for most of the interaction terms. However, we find that different country governance affects the link between VAT and economic efficiency differently in the medium-tax and low-tax countries. We find that political risk stability mitigates the negative impact of VAT collection in medium-tax countries (significant at the 1% level). Higher scores for these indicators indicate lower risk. Hence, our findings suggest that the lower the risk perception of a country, the higher its economic efficiency. This finding is similar to Sang-Heui Lee and Jay van Wyk (2015) who investigated the logistics sector performance across 115 countries. Additionally, prior studies have also found that political risk positively affects economic growth, both generally (Niclas Berggren, Andreas Bergh, and Christian Bjørnskov 2012) and through greater entrepreneurship endeavors (Nabamita Dutta, Russell S. Sobel, and Sanjukta Roy 2013). As highlighted by José Antonio Alonso and Carlos Garcimartín (2013), an institution fulfils its role by reducing instability that will, in turn, result in higher levels of safety and stability, diminishing transaction costs and further encouraging investment in capital accumulation to boost economic efficiency. Besides, we further argue that stability (in terms of economic, political and finance) is important to attract foreign investments and expand business opportunities because it increases the predictability of financial investment and return. This is especially important in countries that are still less developed. This assertion is supported by our results in Tables 6 and 7 in which political risk reduces the regressive effect of VAT in high- and medium- tax countries that mostly consist of developing countries.

On the other hand, we observe that government stability reverses the negative impact on VAT collection in low-tax countries. This may be due to government stability becomes the major concern in developed nations in bringing their economies to the next level of development. Table 8 also shows the results of a model to control for government stability. The result shows that government stability only has marginal effect on economic efficiency. However, when we run the interaction between VAT collection, low-tax countries and government stability, we find that it is marginally significant. This suggests that government stability in low-tax countries improves economic efficiency even with VAT collection. This may be due to government stability always being the main focus of developed economies as the basis of economic stability. This enables the government to ensure uninterrupted implementation of policies and programs that benefit the people, thus leading to efficient distribution of resources in the economy. Similarly, political risk stability is also crucial in mitigating the negative impact of VAT in medium-tax countries. This again demonstrates the importance of government and political stability as the main focus in elevating a country to the next level of its development.

4. Conclusion

Using the two-step system GMM estimation, we first investigate the effect of VAT on economic efficiency. The results suggest that VAT adversely affects economic efficiency. Our finding reaffirms the regressive nature of VAT. We then examine whether country governance quality could reduce the regressive effect of VAT, focusing on four sets of country governance indicators. In general, we find that bureaucratic quality, corruption control, government stability and political risk ratings are able to mitigate the regressive effect of VAT on economic efficiency. This finding supports our prediction that country governance can make the difference in the link between VAT and economic efficiency, thus providing further evidence on the studies of the economic impact of VAT (see Mauro 1995; Keefer and Knack 1997; Chong and Gradstein 2007; Samimi and Salehani 2010).

We further analyze the country governance mechanisms in mitigating the regressive effect of VAT on economic efficiency in different levels of corporate tax rates, finding that the extent to which country governance mitigates the effect of VAT on economic efficiency is contingent upon the way the country groups prioritize the development of each institutional factor. Our results suggest that high corporate tax countries benefit more from better institutional quality than the medium and low corporate tax countries. This finding confirms the role of country governance for better enforcement of tax policy to create less detrimental effect for economic growth. Therefore, better country governance makes taxation more affordable in high corporate tax countries.

This study has several policy implications. First, governments in countries with weak governance should ensure that the implementation of VAT should go hand-in-hand with the efforts to improve the quality of governance. In particular, governments should reduce red tape, improve cohesiveness between government agencies, and enact legislation to support implementation of development policies so that they can channel tax revenues for economic and social purposes. In this instance, the distribution of funds for economic development and social welfare can be done efficiently. Further, as enforcement is the key to minimize the adverse effect of a tax policy, governments must undertake serious and aggressive efforts to combat corruption in the government and private sectors to ensure tax revenues earmarked for economic development and social welfare can reach target groups and programs with minimal leakage. Second, in countries with high corporate tax regime, the governments should ensure sound country governance is put in place to cushion the adverse effect of taxation policy (i.e. VAT and corporate taxation) on individual and corporate taxpayers. Third, governments should take a more holistic approach in implementing tax policy, as opposed to merely introducing a new tax regime such as VAT without simultaneously taking robust steps to enhance the quality of country governance. Higher tax revenue as a result of VAT implementation will not contribute to higher economic efficiency as intended if a country does not have all of the elements making up sound country governance.

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Appendix

Table A1 List of High-Tax Countries and Years of Observation

No.	Country	Year
1	Argentina	1990-2014
2	Australia	2000-2014
3	Belgium	1984-2014
4	Brazil	1984-2014
5	Cameroon	1999-2014
6	Costa Rica	1984-2014
7	Democratic Republic of the Congo	1990-2014
8	El Salvador	1992-2014
9	Ethiopia	2003-2014
10	France	1984-2014
11	Gabon	1995-2014
12	Guinea	1996-2014
13	Guyana	2007-2014
14	Honduras	1984-2014
15	India	2005-2014
16	Italy	1984-2014
17	Japan	1989-2014
18	Kenya	1990-2014
19	Malawi	2002-2014
20	Mali	1991-2014
21	Malta	1997-2014
22	Mexico	1984-2014
23	Morocco	1986-2014
24	Mozambique	2008-2014
25	Namibia	2000-2014
26	Nicaragua	1984-2014
27	Niger	1994-2014
28	Nigeria	1993-2014
29	Pakistan	1990-2014
30	Papua New Guinea	2004-2014
31	Peru	1992-2014
32	Philippines	1998-2014
33	Republic of Congo	2012-2014
34	Senegal	2001-2014
35	Sierra Leone	2009-2014
36	Spain	1986-2014
37	Sudan	2000-2014
38	Tanzania	1998-2014
39	Thailand	1995-2014
40	Uganda	1996-2014
41	Venezuela	1993-2014
42	Zambia	1995-2014

Notes: For the corporate tax rates table see KPMG Group (2017)[4]. High-tax countries are based on countries with corporate tax rates of 30% and above, extracted from the Tax Foundation (2017)[5].

Source: Authors' calculations.

[4] **KPMG Group.** 2017. Corporate Tax Rates Table. https://home.kpmg.com/xx/en/home/services/tax/tax-tools-and-resources/tax-rates-online/corporate-tax-rates-table.html (accessed December 14, 2017).
[5] **Tax Foundation.** 2017. Corporate Income Tax Rates around the World, 2015. http://taxfoundation.org/article/corporate-income-tax-rates-around-world-2015 (accessed December 14, 2017).

Table A2 List of Medium-Tax Countries and Years of Observation

No.	Country	Year
1	Algeria	1992-2014
2	Armenia	1995-2014
3	Austria	1984-2014
4	Azerbaijan	1992-2014
5	Bangladesh	1991-2014
6	Bolivia	1986-2014
7	Botswana	2002-2014
8	Burkina Faso	1993-2014
9	Canada	1991-2014
10	Chile	1990-2014
11	China	1990-2014
12	Colombia	1994-2014
13	Croatia	1998-2014
14	Denmark	1984-2014
15	Dominican Republic	1990-2014
16	Ecuador	1984-2014
17	Egypt	1991-2014
18	Estonia	1991-2014
19	Finland	1984-2014
20	Germany	1984-2014
21	Ghana	1998-2014
22	Greece	1987-2014
23	Guatemala	1990-2014
24	Guinea-Bissau	2001-2014
25	Iceland	1990-2014
26	Indonesia	1990-2014
27	Iran	2008-2014
28	Israel	1984-2014
29	Ivory Coast	1984-2014
30	Jamaica	1991-2014
31	Jordan	2001-2014
32	Kazakhstan	1991-2014
33	Luxembourg	1984-2014
34	Madagascar	1994-2014
35	Mongolia	1998-2014
36	Netherlands	1984-2014
37	New Zealand	1986-2014
38	Norway	1984-2014
39	Panama	1984-2014
40	Portugal	1986-2014
41	Russia	1991-2014
42	Slovak Republic	1993-2014
43	South Africa	1984-2014
44	South Korea	1984-2014
45	Sri Lanka	2002-2014
46	Sweden	1984-2014
47	Togo	1995-2014
48	Trinidad and Tobago	1990-2014

49	Tunisia	1988-2014
50	Turkey	1985-2014
51	United Kingdom	1984-2014
52	Uruguay	1990-2014
53	Vietnam	1999-2014
54	Zimbabwe	2004-2014

Notes: For the corporate tax rates table see KPMG Group (2017). High-tax countries are based on countries with corporate tax rates of 30% and above, extracted from the Tax Foundation (2017).

Source: Authors' calculations.

Table A3 List of Low-Tax Countries and Years of Observation

No.	Country	Year
1	Albania	1997-2014
2	Belarus	1991-2014
3	Bulgaria	1994-2014
4	Cyprus	1992-2014
5	Czech Republic	1993-2014
6	Hungary	1991-2014
7	Ireland	1984-2014
8	Latvia	1995-2014
9	Lebanon	2002-2014
10	Lithuania	1994-2014
11	Moldova	1998-2014
12	Paraguay	1992-2014
13	Poland	1993-2014
14	Romania	1995-2014
15	Serbia	2004-2014
16	Singapore	1993-2014
17	Slovenia	1999-2014
18	Switzerland	1984-2014
19	Taiwan	1986-2014
20	Ukraine	1992-2014

Notes: For the corporate tax rates table see KPMG Group (2017). High-tax countries are based on countries with corporate tax rates of 30% and above, extracted from the Tax Foundation (2017).

Source: Authors' calculations.

Table A4 Summary Statistics of Explanatory Variables

Variable	Mean	Std. dev.	Min	Max
Full sample (*N = 2609*)				
Economic efficiency (%)	51.63	28.47	0.22	100.00
Value-added tax (%) to GDP	7.57	6.56	0.00	95.96
Bureaucratic quality	2.39	1.14	0.00	4.00
Corruption	3.11	1.41	0.00	6.00
Government stability	8.00	1.87	1.00	12.00
Political risk rating	68.14	13.26	22.00	97.00
Real GDP growth (base year 2005, %)	3.62	4.22	-23.10	34.50
Inflation rate (%)	48.27	593.82	-10.63	23773.13
Government expenditure (%) to GDP	28.06	12.99	0.00	108.45
Trade openness	0.79	0.48	0.09	4.40
Labor force quality	85.14	19.63	8.03	100.00

Population growth (%)	1.21	1.13	-2.85	6.02
High-tax countries (*N = 862*)				
Economic efficiency (%)	50.14	24.73	0.22	100.00
Value-added tax (%) to GDP	6.04	3.82	0.00	20.40
Bureaucratic quality	2.05	1.07	0.00	4.00
Corruption	2.69	1.15	0.00	6.00
Government stability	7.78	1.92	1.00	11.00
Political risk rating	63.00	12.88	22.00	89.00
Real GDP growth (base year 2005, %)	3.68	3.79	-13.47	33.74
Inflation rate (%)	97.86	1001.21	-6.24	23773.10
Government spending (%) to GDP	24.03	11.53	1.36	108.45
Trade openness	0.64	0.38	0.09	2.63
Labor force quality	75.47	22.82	8.03	100.00
Population growth (%)	1.78	1.00	-0.46	4.03
Medium-tax countries (*N = 1316*)				
Economic efficiency (%)	51.32	29.11	0.28	100.00
Value-added tax (%) to GDP	8.03	6.42	0.00	95.96
Bureaucratic quality	2.55	1.15	0.00	4.00
Corruption	3.40	1.53	0.00	6.00
Government stability	8.10	1.87	2.00	12.00
Political risk rating	69.88	13.43	34.00	97.00
Real GDP growth (base year 2005, %)	3.64	4.26	-23.10	34.50
Inflation rate (%)	17.08	102.26	-10.63	1662.22
Government spending (%) to GDP	29.00	13.72	0.00	77.96
Trade openness	0.78	0.41	0.16	3.74
Labor force quality	87.32	17.39	12.80	100.00
Population growth (%)	1.13	0.96	-2.85	6.02
Low-tax countries (*N = 431*)				
Economic efficiency (%)	55.55	29.17	0.41	100.00
Value-added tax (%) to GDP	9.23	9.88	0.21	69.70
Bureaucratic quality	2.56	1.10	1.00	4.00
Corruption	3.06	1.24	1.00	6.00
Government stability	8.15	1.71	4.00	11.00
Political risk rating	73.09	9.85	52.00	97.00
Real GDP growth (base year 2005, %)	3.47	4.87	-22.93	16.99
Inflation rate (%)	44.31	302.71	-4.48	4734.91
Government spending (%) to GDP	33.26	10.90	11.63	65.65
Trade openness	1.15	0.67	0.38	4.40
Labor force quality	97.82	2.61	86.90	100.00
Population growth (%)	0.28	1.16	-2.26	5.32

Source: Authors' calculations.