Araştırma Makalesi ● *Research Article*

Does Quality of Governance Affect Tax Effort in Sub-Saharan Africa?

Yönetişim Kalitesi Sahra Altı Afrika Ülkelerinde Vergi Gayretini Etkiliyor mu?

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MAKALE BİLGİSİ	ÖZ
Makale Geçmişi: Başvuru tarihi: 15 Eylül 2021 Düzeltme tarihi: 12 Kasım 2021 Kabul tarihi: 19 Aralık 2021 Anahtar Kelimeler: Vergi Eforu Yönetişim Kalitesi Sahra Altı Afrika System-GMM	Bu çalışmanın amacı, Sahra Altı Afrika (SAA) ülkelerinde yönetişim kalitesinin vergi gayreti üzerindeki etkisini ampirik olarak incelemektir. Bu doğrultuda 37 SAA ülkesinin 2002-2015 dönemini kapsayan verileri geleneksel panel veri modelleri ve Sistem Genelleştirilmiş Momentler Metodu (Sys-GMM) tahmincisi ile araştırılmıştır. Daha önceki çalışmalardan farklı olarak bu çalımada hem Dünya Bankası'nın altı yönetişim göstergesinin hem de bütünleştirilmiş yönetişim endeksinin vergi gayreti üzerindeki etkisi analiz edilmiştir. Ampirik bulgular SAA ülkelerinde bütünleşik yönetişimin ve her bir yönetişim göstergesinin vergi gayretini pozitif etkilediğini göstermektedir. Ayrıca güçlendirilmiş ampirik bulgular SAA ülkelerinde ifade özgürlüğü ve hesap verebilirlik ile hukukun üstünlüğü gibi demokrasi temsillerinin vergi gayretini daha önemli belirleyicileri olduğunu da ortaya koymaktadır.

ARTICLE INFO	ABSTRACT
Article history: Received: Sep 15, 2020 Received in revised form: Nov 12, 2021 Accepted: Dec 19, 2021 Keywords: Tax Effort Quality of Governance Sub-Saharan Africa System-GMM	This study aims to empirically analyze the impact of governance quality on tax effort in Sub-Saharan African (SSA) countries. Based on a dataset for 37 SSA countries over the time period of 2002-2015, the governance and tax effort relationships is examined by using conventional panel data models and system-generalized method of moment (Sys-GMM) estimators. Unlike previous studies, this study analyzes the impact of both six governance indicators of the World Bank and the composite quality of governance index on tax effort. The empirical findings indicated that composite governance and all of the governance indicators positively affect tax effort in SSA countries. The robust empirical findings also indicate that democracy representatives such as voice and accountability and the rule of law are relatively more important determinants of tax effort in SSA countries.

1. Introduction

The most severe problem that many developing countries suffer is not having sufficient domestic sources for development projects; thus, they generally require external financing. While the over-dependency on external sources generates problems for developing countries in the long term, these countries should give importance to domestic revenue mobilization (Gupta, 2007). Most problems concerning economic growth and sustainable development originate from insufficient domestic revenue mobilization in developing countries (Chand and Moene, 1999). For

developing countries, when allocated to efficient investments, tax incomes, which constitute the most significant part of the revenue mobilization, can be a crucial tool for reaching higher growth rate and sustainability. Developing countries that require solving growth slowdown problems must invest more in areas such as infrastructure, education, and health; thus, they must increase the tax effort (Bird et al., 2008). High tax effort carries exceptional importance for countries with low revenues in the aspects of reducing dependency on external aid, promoting good governance, and enhancing state-building and endorsing the accountability of governments (Le et al., 2012).

Sub-Saharan African countries are generally identified with an insufficient supply of public goods, large-scale debts, and over-dependency on external aid or external grants. In these countries, the response to external debt obligations usually becomes more indebted, resulting in excessive debt accumulation. In addition to this, due to an array of institutional problems, they cannot gain a sufficient amount of public revenue. Government interference at structural determinants of tax effort in the short term is actually hard, but it can make adjustments on economic policies, control of corruption, and tax management standards as well (Ghura, 1998). In order to increase tax effort and ensure economic growth, precautions regarding the governance standards, such as control of corruption and reinforcing tax configuration, are vital in developing and SSA countries (Epaphra and Massawe, 2017). Governance quality is among one of the major factors in determining tax effort in developing countries (Tanzi and Davoodi, 1997; Ghura, 1998; Gupta, 2007; Bird et al., 2014).

The most evident problem that causes low tax effort in SSA countries is corruption. Corruption delimitates many public services, such as health care and education, by diminishing public revenue (Gupta et al., 2000). In addition to this, fighting against corruption might be difficult in developing countries due to the high protection of unearned income beholders and excessive amounts of money that requires building a technology that detects tax evaders (Celimene et al., 2016). Political instability is another reason for low tax effort in developing countries. In countries that experience political instability, citizens might prefer building up savings to access private services instead of paying taxes since they do not rely on the pledges of governments towards a rise of quality in public services and economic growth (Yohou et al., 2015). It can be claimed that political stability, management effectiveness, and trust in government are like preconditions for a fair, effective, and efficient taxation system (Everest-Philips and Sandall, 2009).

Besides the issues that were mentioned above, particularly in developing countries, inefficient tax administration, inconsistent corporate governance, and extensive unrecorded economy affect the economic growth and development negatively by significantly reducing tax incomes. Hence, it can be stated that effective public management, including tax administration, is a distinct determinant of tax revenues. In fact, an effective government ensures an effective tax system. It is possible to increase tax income by establishing improved tax management and competent administration, precise macroeconomic policies, and the rule of law (Ajaz and Ahmad, 2010). The absence of the rule of law and institutional accountability also influences the low tax effort (Abed and Gupta, 2002) since distrust on the state of the law might negatively affect voluntary compliance to formal economy (Torgler et al., 2011). Therefore, policies that promote enhancement in transparency and accountability that ameliorate the governance mechanisms through an independent and efficient justice system has a vital impact on tax effort (Arif and Rawat, 2018). Empirical and theoretical literature highlights the importance of these factors, which constitute the quality of governance in increasing tax effort in developing countries.

The purpose of this study is to investigate the answer to the question of whether governance quality increases tax effort in SSA countries. Government effectiveness, political stability, regulatory quality, the rule of law, voice and accountability and control of corruption compiled by World Bank were used as indicators of the quality of governance. Understanding the role of factors regarding the quality of governance in increasing tax effort would allow for policy implications and reforms proposals to be drawn on how to raise tax mobilization more efficiently. In this context, the impact of governance quality on tax effort in 2002-2015 is analyzed with panel ordinary least square, fixed effects, and System-GMM estimators in 37 SSA countries. This study is considered as a contribution to the literature in several aspects. First, along with the limited number of studies that analyze SSA countries, a considerable amount of these studies focuses on the linkage between one or a few governance indicators and tax effort. As in Epaphra and Massawe's (2017) study, this paper also examines the impact of each governance indicators on tax effort. However, the impact of composite governance index on tax effort is also examined in this study. On the other hand, GMM estimation procedure is employed along with traditional panel data models by regarding the possibility of endogeneity between taxation and governance. Second, many previous studies (among others, Ghura, 1998; Gupta, 2007; Thornton, 2008; Pessino and Fenechietto, 2010; Baum et al., 2017; Epaphra and Massawe, 2017) have shown that the most important governance indicators on tax effort are control of corruption and government effectiveness in developing and SSA countries. The robust estimation results of this study indicate that public bureaucracy has undeniable importance for tax effort and underlines that state of law and democracy relatively impose a more considerable significance. The research provides clear evidence of the importance of all governance indicators in enhancing tax effort. Particularly, reforms that improve the level of democracy and state of law seem to be effective strategies to boost tax effort in SSA countries.

The rest of this paper is organized as follows. The next section presents the theoretical approaches that demonstrate the relationship between tax effort and governance quality and results of empirical analysis. Section III introduces the model specification of this study and using variables. Empirical methodology and estimation strategies are represented in Section IV. Section V presents the empirical findings of the empirical analysis, and the last section draws conclusions.

2. Literature Review

Tax effort shows the relation between collected revenue and tax capacity and demonstrates which level of tax capacity was reached (Ahmed and Stern, 1989). Tax effort plays a crucial role in devising tax policies while providing insight or whether the tax revenue has increased (Pessino and Fenochietto, 2010). In developing countries, there is a strong emphasis that governance standards are particularly strong factors that determine the tax effort (Tanzi and Davoodi, 1997; Ghura, 1998; Gupta, 2007; Bird et al., 2014) and many studies based on SSA countries highlight the importance of governance indicators in obtaining domestic revenue mobilization (Ghura, 1998; Thornton, 2008; Botlhole et al. 2012; Epaphra and Massawe, 2017; Mawejje, 2019).

Throughout the last three decades, the question of which factors determine the tax effort, especially in developing countries, was frequently investigated. Various governance indicators such as corruption, democracy, poverty, and political stability were all researched as a possible determinant of tax effort, and previous literature shows that good governance leads to high tax effort in developing countries. However, it must be stated that, especially since the 1990s, corruption as an indicator was heavily highlighted in academic circles compared to other governance indicators. Several empirical studies that investigate the relationship between governance indicators and tax effort and summarized results were presented in Appendix Table 6, and this section also refers to some of those.

Corruption, which is one of the factors that affect the governance standards, instigates conserving interests of corrupted individuals instead of the society, which decreases the efficiency of administration (Purohit, 2007). Many previous studies that focus on the linkage between corruption and tax effort underline the evident negative relationship between these notions (see for example, Ghura, 1998; Sanyal et al., 2000; Gupta, 2007; Bird et al., 2014; Aghion et al., 2016). Ghura (1998) empirically shows that corruption negatively affects tax effort in SSA countries. Similarly, Bird et al. (2014) emphasize that the low quality of governance and corruption in tax administration reduce tax revenue by damaging taxpayer's trust in tax authorities; thus, states the factors such as governance quality, the rule of law, and corruption affect tax effort. Sanyal et al. (2000) claim that corruption and tax revenues have a Laffer type relation. The study shows that corruption causes a decline in total tax revenues by increasing tax rates. Correspondingly, Atilla (2008) has stated that corruption harms economic growth by increasing tax rates. In their study, that has proved the reverse relation between corruption and tax revenues, Baum et al. (2017) state that erosion in tax revenues is caused by tax non-compliance.

Some other works underline that corruption damages economic and political factors in addition to tax effort. Fjedstad and Tungodden (2003) claim that while augmentation of corruption might increase tax revenue, in the long term, this would reverse. Moreover, the authors remark that using corruption as a political tool undermines the quality of tax administration. The study of Tanzi (1998) demonstrates that corruption expands public expenditures while diminishing public revenues. As a result of this, corruption weakens the implementation of effective fiscal policies by increasing fiscal deficits. Ghosh and Neanidis (2010) study the impact of corruption on inflation, taxation, and economic growth through large sample. According to the results of this study, corruption increases seigniorage and tax rates by decreasing tax revenues, causing a decline in the efficiency of public expenditures, and negatively affects economic growth. Aghion et al. (2016) state in another study in which the relationship between corruption and economic growth in examined that reducing corruption has a positive impact on economic welfare since it increases tax revenues.

Some various studies that investigate the relationship between corruption and tax performance show that certain tax types are more sensitive to corruption than others. For example, the study sampled with forty SSA and fourteen the Middle East and North Africa countries, Thornton (2008) infers that the negative effect of corruption on tax revenues is at a higher rate in the incomes attained from domestic and international trade and social security contributions. Tanzi and Davoodi (2000) investigate the relationship between economic growth and fiscal policy. The results show that corruption negatively affects economic growth. The results also show that direct taxes get affected less from corruption than indirect taxes. The study of Bagdigen and Beskaya (2005) infers that corruption reduces tax revenues; however, the decrease in tax revenues is higher than indirect taxes.

According to Everest-Phillips and Sandall (2009), an efficient tax performance cannot be evaluated independently from institutional capacity. Besley and Persson (2014) claim that additionally to economic factors, non-transparent public administration also affects tax efforts in developing countries. Political instability and polarized political structure deepen the tendency to seigniorage by increasing the cost of tax collection (Cukierman et al., 1992). There are two main characteristics of political instability; unstable governments and inconsistent policies that prevent long term reform programs (Ajaz and Ahmad, 2010). Gupta (2007) presents empirical evidence regarding the adverse effects of corruption and political instability on tax performance. Institutional problems also harm voluntary tax

compliance since taxpayers who believe that their taxes are going to end up in the pockets of politicians instead of public services will not want to complete their tax duties on time (Uslaner, 2010). Moreover, not only the political instability affects tax incomes negatively, but it also carries the potential of escalating violent acts by undermining macroeconomic stability and social coherence.

Ajaz and Ahmad (2010) find that corruption and all indicators of governance quality are crucial determinants of tax revenues, revealing that corruption reduces tax revenues and governance quality as a whole by impacting tax performance. The study of Le et al. (2012) on 110 developed and developing countries demonstrate that high-quality bureaucracy induces a decline in poverty and increases tax performance. Moreover, another conclusion of the study is that political stability imposes a compelling impact on indirect taxes and taxes regarding international trade. Lien (2015) investigates the relationship between the quality of governance and tax performance in eighty-two developing countries. According to empirical findings, all governance indicators of the World Bank has a positive effect on tax performance in the full sample, low-income countries (LICs), and lower-MIC's whereas the relationship is reversed in upper-MICs and high-income countries (HICs). The relationship between governance quality and tax performance in HIC's is actually less certain when compared to MICs or LICs. For instance, the research of Topal and Sahin (2017) on OECD countries provides evidence that there is a significant relationship between quality of governance and tax revenues in only fifteen upper MICs. In another research of Epaphra and Massawe (2017) on thirty LIC and MIC African countries reveals that corruption and deterioration in all other governance indicators cause a reduction in tax revenues. Moreover, the results show that an increase in all governance quality indicators leads to an increase in indirect taxes.

Democracy is an important institutional factor to increase tax revenue mobilization in developing countries. Elbahnasawy (2020) claims that democracy provides more voluntary tax compliance and higher tax revenue. Çevik (2018) empirically investigate the relationship between democracy and tax revenues in 135 countries. The empirical findings show that indirect taxes and broad-based taxes are more associated with higher democracy than indirect and narrow-based taxes. In their research sampled with 44 countries, Aizenmann and Jinjarak (2005) concluded that an increase in political stability and democratic participation boost value-added tax performance.

On the other hand, Bird et al. (2008) indicate that an increase in the freedom of speech and accountability as indicators of democracy increases tax performances not only in developing countries but also in developed countries. In their research that examines the relationship between democracy and tax effort, Profeta et al. (2013) consider two variables which are the political strength of democratic institutions and the protection of civil liberties as

representations of democracy. The findings of their study refer to the somewhat significant relationship between tax revenues and political factors as well as pointing out that the relationship also shows fundamental changes in European Union, Latin America, and South-East Asia countries. In another study, Prichard et al. (2018) find that democracy has a positive effect on tax revenues but has a negative effect on non-tax incomes. The authors also emphasize that the governments of countries with the possibility of obtaining non-tax revenues, risk of the natural resource curse, and low dependence on tax revenues have a lower level of democratic governance and accountability. Similar empirical evidence can be seen in the study of Bornhorst et al. (2009) and Mawejje (2019). On the other hand, according to the results of Mawejje's (2019) research increasing the level of voice and accountability increases tax revenue in the SSA countries. However, the level of corruption does not have a statistically significant impact on total tax revenue. The empirical researches of Botlhole et al. (2012) with sampled 45 SSA countries show that tax revenues decrease when the resource revenues increase. However, an increase in the GDP per capita and the institutional capacity prevents the negative impacts of resources curse. In the case of resources curse, authors also point out that acquiring a high tax performance requires transaction costs.

Numerous studies emphasize the importance of preventive measures that aim to increase governance capacity. For instance, while Chand and Moene (1999) draw attention to the importance of working conditions of tax officers and organizational regulations against corruption, Imam and Jacobs (2007) state that there should be reforms that intend to either diminish crime or forming tax categories that are less prone to it. Moreover, along with stating that modernization in tax administration and simplifying tax system might be useful in increasing tax effort through diminishing corruption. Authors also add that media plays a crucial role in reducing corruption. Potanlar et al. (2010) highlight the crucial importance of the reforms that aim to prevent corruption and to strengthen the tax systems in developing economies. Similarly, Pessino and Fenochietto (2010) draw attention to the necessity of removing the inadequacies of institutional capacity to obtain high tax effort in developing countries. The authors also stated that the most important governance indicator is the control of corruption to increase tax effort. Arif and Rawat (2018) empirically exhibit the positive and significant effect of the low corruption and high quality of governance on the tax revenue. The authors also emphasize the administrative precautions towards control of corruption, increasing bureaucracy quality and the rule of law, and broadening the tax base. Lien (2015) states that to have high tax effort, the governments of less developed and developing countries should enrich democratic rights, particularly freedom of speech and the right to vote. Purohit (2007) claims that the only way to reduce corruption is to increase transparency and accountability in democratic systems. On the other hand, Rakner and Gloppen (2003) state that when governmental accountability is perceived as high, voluntary

tax compliance will also be high, and tax collection costs will decrease. Moreover, the authors emphasize the importance of corporate capacity and political legitimacy that leads up to democratization instead of coercive policies.

3. Model Specification and Data

The aim of this study is to investigate the relationship between the quality of governance and tax effort in SSA countries. Following the previous literature, a testable equation for tax effort can be given as follows:

Tax Effort (T/Y) = f(Y, IND, AGR, INF, OPEN, FDI, AID, URB, SARAs, QGI (or GE / PS / RQ / RL / VOA / CC / CP))   (1)

The dependent variable of the research model is tax effort. Tax effort is defined as total tax revenue to GDP ratio, following the traditional literature (for example among others, Stotsky and WoldeMariam, 1997; Ghura, 1998; Eltony, 2002; Gupta, 2007; Alonso and Garcimartin, 2011; Le et al., 2012; Bird et al., 2014). The main explanatory variable is the quality of governance indicators. The World Bank compiles six governance indicators (government effectiveness – GE, political stability – PS, regulatory quality – RQ, the rule of law – RL, voice and accountability – VOA, and control of corruption – CC) that was proposed by Kauffman et al. (2010) since 1996. In this study, firstly, the impact of the composite quality of governance on tax effort was examined (Estimation 1). To calculate the composite governance index (QGI) of each country, a methodology proposed by Topal and Sahin (2017) was used. Governance quality series of all countries are acquired by employing principal component analysis (PCA) to six governance indicators of the World Bank. Principal component analysis is a multivariate statistical technique that allows combining inter-correlated variables into a single variable (Topal and Sahin, 2017; Arif and Rawat, 2018). Subsequently, based on the country with the highest governance quality, each country's series is transformed to the quality of governance index that changing between -100 and +100. Moreover, since the governance indicators have a very high correlation of 0.70 and above (see Table 2, correlation matrix), the impact of each of the six quality of governance indicators on tax effort is estimated separately in order to eliminate the multicollinearity problem (Estimation 2 to 7). Additionally, Transparency International's corruption perception index (CPI) was used together with the control of corruption (CC) to estimate the impact of corruption on tax effort (Estimation 8). We expect that composite quality of governance and each governance indicators positively affect tax effort.

The other determinants of tax effort are control variables of all estimation models. What affects tax effort has been the subject of a long debate (Agbeyegbe et al., 2006; Gupta, 2007). Although common variables are used in most studies, it can be seen that different variables are used in some research as well. Real GDP per capita (Y) is expected to be a good proxy of the overall level of economic development and sophistication of the economic structure (Gupta, 2007).

Generally, a positive association between GDP per capita and tax effort is expected (Hinrichs, 1966; Tanzi, 1992; Tanzi and Zee, 2000; Pessino and Fenochietto, 2010). Because first, according to Wagner Law, the income elasticity of public expenditures is high, and public expenditures increase together with economic growth. Therefore, countries with a low rate of economic growth also have low tax effort. In conjunction with economic development, tax effort, and tax capacity also increase (Musgrave, 1969; Chelliah, 1971; Tanzi, 1987). Second, economic development expands the tax base. The rate of tax base expansion is higher than the rate of economic growth (Ayanew, 2016). Third, the efficiency of revenue agencies advances with economic development (Agbeyegbe et al., 2006). There is much empirical evidence in the literature that suggests GDP per capita growth increases tax effort (see for example, Ghura, 1998; Eltony, 2002; Gupta, 2007; Le et al., 2012; Bird et al., 2014; Ayanew, 2016; Mawejje, 2019). However, a number of studies show that positive relation might change depending on the level of economic development (see for example Piancastelli, 2001) or statistically not significant (see for example, Agbeyegbe et al., 2006; Addison and Levin, 2012; Epaphra and Massawe, 2017). Fewer studies present a negative relationship between GDP per capita and tax effort (see for example, Teera, 2003; Teera and Hudson, 2004).

With economic development, the sectoral composition of production changes from agriculture to industry or services. The share of agriculture is relatively higher in less developed economies than the middle or high-income countries. However, taxation of agriculture is more difficult compared to international trade and industry. This situation might have originated from both principles of public policies and/or conditions (Tanzi, 1992; Stotsky and WoldeMariam, 1997). First, the labour force usually works for a subsistence wage in agriculture. Second, the rates of informal employment and the seasonal labour force are relatively higher in agriculture (Gupta, 2007). Third, the size of agricultural enterprises is small, and taxable items do not generate surplus production in agriculture (Ayenew, 2016). Fourth, when the share of agriculture in the GDP increases, the need for total public expenditures and tax revenues decrease (Teera, 2003). Many previous studies have found a negative relationship between the share of agriculture and the tax effort (see for example, Chelliah, 1971; Tanzi, 1992; Ghura, 1998; Teera and Hudson, 2004; Gupta, 2007; Addison and Levin, 2012; Epaphra and Massawe, 2017; Mawejje, 2019).

On the other hand, even after controlling the GDP per capita growth, though, a positive relationship might be found in SSA countries because agricultural exports are sometimes a good tax handle in these countries (Agbeyegbe et al., 2006). Contrary to agriculture, it is expected that the share of industry (IND) positively affects tax effort. The growth of industry creates a higher rate of economic growth, and industrial production accelerates economic development. Therefore, the amount of taxable income and products expands. Moreover, the taxation of the industry is easier than

agriculture. A number of previous studies present empirical evidence that shows tax revenues increase when the industrialization of a country increase (see for example, Piancastelli, 2001; Ayenew, 2016).

A continuous increase in the general level of prices (INF) that an indicator of economic stability is one important obstacle to the tax revenue mobilization (Mawejje, 2019). In fact, since stable but low inflation will spike business profits, tax revenues can also increase in a highly progressive tax structure (Pessino and Fenochietto, 2010; Ade et al., 2018). Nevertheless, high inflation weakens the taxpaying capacity by reducing purchasing power. High inflation escalates the operation costs of businesses and increases the amount of informality and illegal activities. On the other hand, high inflation also increases tax resistance due to actions such as tax evasion or tax avoidance. Hence voluntary tax compliance weakens when the general level of prices increases (Crane and Nourzad, 1986; Pessino and Fenochietto, 2010). Many previous studies provide evidence of a negative relationship between inflation and tax effort (see for example, Ghura, 1998; Agbeyegbe et al., 2006; Ayenew, 2016; Epaphra and Massawe, 2017).

Trade liberalization or openness is considered as one of the vital determinants of tax effort (Rodrik, 1988; Piancastelli, 2001; Keen and Simone, 2004; Norregard and Khan, 2007; Aizenman and Jinjarak, 2009). However, the net impact of trade liberalization on tax effort is still not exactly clear (Gupta, 2007). Le et al. (2012) emphasize that trade openness has two opposite effects on tax effort. First, countries aim to encourage international trade through tax concession could result in a decreasing in tax incomes from foreign trade. Second, due to higher rate of trade openness associated with a high rate of economic growth (see, Alcala and Ciccone, 2004; Frankel and Romer, 1999), the rapid development of open economies might expand the tax base and increase tax effort.

On the other hand, Keen and Simone (2004) claim that trade liberalization will increase revenues due to an improvement in customs procedures, while Linn and Wetzel (1990) point out that taxes on foreign trade are a natural source of income for governments in countries where administrative capacity is weak. Rodrik (1998) emphasizes the positive relationship between tax effort and the trade openness by claiming that the public sector will be as insurance in more open economies against global risks. Despite the opposite effects, many previous studies present evidence on the positive relationship between trade openness and tax effort (see for example, Leuthold, 1991; Stotsky and WoldeMariam, 1997; Piancastelli, 2001; Eltony, 2002; Bahl, 2004; Le et al., 2012; Mawejje, 2019).

Another economic factor in which the effect on tax effort is uncertain is foreign direct investment (FDI) inflows. There are possible positive and negative impacts of FDI on tax effort. Foreign direct investment inflows might increase tax effort if it causes an increase in the number of taxpayers, high technology and knowledge spillover, advancement in management skills (Borensztein et al., 1998; Saggi, 2002; Blalock and Gertler, 2005; Nyugen et al., 2013). Foreign direct investment inflows also increase tax effort due to an increase in competition, crowding-in effect (Demena and Bergejik, 2019), employment, and more skilled labour (Zeb et al., 2014). Besides, when FDI inflows affect economic growth positively, it increases the total demand in the economy and contributes to collecting more taxes (Mahmood and Chaudry, 2013). However, depending on some impacts of it, FDI inflows might decrease tax effort. First, since tax concessions towards FDI (Nyugen et al., 2013) and multi-national enterprises acting with the motivation of transfer pricing (Gropp and Kostial, 2000) decline the tax incomes of the host country. Second, FDI can reduce the efficiency and production of domestic companies by bringing out a destructive crowding-out effect (Long, 2005; Nyugen et al., 2013). There are limited numbers of studies that examine how FDI inflows affect tax effort. The findings of these studies are far from presenting a joint conclusion (see for example, Mahmood and Chaudry, 2013; Odabaş, 2016; Jeza et al., 2016; Pratomo, 2019; Mawejje, 2019).

Foreign aid and foreign grants have been an essential source of financial development for many developing economies in recent years. However, the possible impact of external aid (AID) on tax effort remains controversial. There is a general concern that foreign aids reduce tax effort because it is commonly abused (Franco-Rodriguez et al., 1998; Teera, 2003; Gupta, 2007; Chaudhry and Munir, 2010). However, empirical evidence about the impact of foreign aid on tax effort is inconclusive. Some studies show that the effects of grants and loans on tax effort vary (see for example, Gupta et al., 2003; Hisali and Ddumba-Ssentamu, 2013). While some studies provide empirical evidence that there is a negative (see for example; Franco-Rodriguez et al., 1998; Benedek et al., 2014; Mawejje, 2019) or not significant relationship (see for example, Agbeyegbe et al., 2006; Teera and Hudson, 2004; Addison and Levin, 2012) between foreign aid and tax effort. Fewer studies show a positive relationship between foreign aid and tax effort (see for example, Teera, 2003; Mahdawi, 2008; Clist and Morrisey, 2011; Clist, 2016; Mascagni, 2016). There is even empirical evidence indicating that the relationship between foreign aid and tax effort can change due to economic development and institutional quality differences (see for example, Gupta, 2007; Alonso and Garcimartin, 2011).

Urbanization is essential because of its societal, political, and cultural impact, as well as being an economic phenomenon. Urbanization (URB) raises the demand for public services and contributes to the increase of tax effort by simplifying taxation (Tanzi, 1987; Al-Hakami, 2008). Urbanization has supply oriented effects as well as demand. Urbanization causes economic activities in the cities to intensify, thus increases tax effort by expanding the tax base (Khattry and Rao, 2002). However, Addison and Levin (2012) did not find relevant evidence in their study in SSA countries where the density of the rural population is high.

In some developing countries where political corruption and patronage are high, low tax revenue mobilization affects economic development negatively (Dom, 2019). This is particularly true in developing and especially in SSA countries. Semi-autonomous revenue authorities (SARAs) that are autonomous from general tax administration have been introduced across SSA in the context of new public management since the 1990s. It is expected that SARAs can positively affect tax effort due to their managerial outputs in SSA. Trust in government is low, and voluntary tax compliance is also weak in some SSA countries. Semi-autonomous revenue authorities might enhance the trust in the government and increase tax compliance by establishing a credible process of payment (Chand and Moone, 1999; Talierco, 2004; Fjelstad and Moore, 2009). The improvements in the human resources, budgets, organizational and financial autonomy of the SARAs provide a new management space and management flexibility against the strict public bureaucracy (Kidd and Crandall, 2006; Dom, 2019). Moreover, according to some authors, giving a certain part of collected incomes to SARAs provides an additional incentive for increasing collection of revenues (Toma and Toma, 1992). However, SARAs also have certain disadvantages. Semi-autonomous revenue authorities that acts as a traditional revenue administration might be oblivious of local, regional, or national preferences (Andrews, 2013). Besides, SARAs can disrupt the democratic situation by damaging fiscal bargaining equilibrium between taxpayers and the state, and render their presence to dysfunctional. Previous studies are far away from offering a clear conclusion on the impact of SARAs on revenue performance. While some studies present empirical evidence indicating that there is no significant relationship between SARAs and tax effort (see for example, Dom, 2019), others highlighted the positive effects of SARAs on tax effort (see for example, Ade et al., 2010; von Haldenwang et al., 2014; Ebeke, 2016). Some other empirical evidence suggests that the income-increasing effects of SARAs are only temporary (high in early period) but unsustainable (see for example, Ahlerup et al., 2015), or that their income-increasing effects vary according to country conditions (see for example, Sarr, 2016).

The analysis, based on panel methods, spans 14 years from 2002–2015 and is based on 37 SSA countries. The countries included in the sample are given in the Appendix, Table 7. In the examined period, 10 of 37 SSA countries have SARAs (Sarr, 2016). Tax revenue data of countries were obtained from the Government Revenue Dataset (GRD, 2018) of the International Center for Tax and Development (ICTD). Gross domestic product per capita, value-added of industry and agriculture to GDP ratio, consumer price index, foreign aid, and urban population were obtained from the World Bank's World Development Indicators (WDI, 2018) dataset. Trade openness and FDI inflows data were obtained from United Nations Conference on Trade and Development (UNCTAD, 2018) database, while the quality of governance indicators was taken from the World Bank's World

Governance Indicators (WGI, 2018) dataset. In addition, corruption perception index data of countries was compiled from the Transparency International (2018) reports. The information regarding defining the variables in the research model was presented in Appendix (Table 8).

Table 1 represents the descriptive statistics of the variables. The average total tax revenues to GDP ratio is around 14% in SSA countries over the period of 2002-2015. In 2015, the country with the lowest tax effort was Nigeria with 4.9%, while Seychelles was the highest with 29.9%. The average quality of governance is considerably low. It is about -31 (in the range of -100 to +100) in the examined period. According to data of 2015, the country with the highest level of quality of governance (QGI = 87.8) is Cape Verde (world ranking 9), while the lowest (QGI = -85.2) country is Central African Republic (world ranking 197).

Table 1. Summary statistics (37 SSA countries)

Variables	2002 - 2015					2015	
	Obs	Mean	SD	Min	Max	Min	Max
Tax Effort	518	13.8	6.2	2.2	32.9	4.9 [NGA]	29.9 [SYC]
GDP per capita	518	2088.4	2785.4	193.9	13542	226.5 [BDI]	13542 [SYC]
Industry	499	25.2	13.2	2.6	77.4	2.6 [SDN]	54.7 [COG]
Agriculture	501	25.3	16.0	2.0	79.0	2.3 [ZAF]	60.5 [SLE]
Inflation	511	59.4	1080	-35.8	24411	-2.3 [ZWE]	37.1 [CAF]
Foreign Aid	518	845	1056	0.052	12852	7.72 [SYC]	3528.5 [ETH]
Urbanisation	518	39.3	16.2	8.6	87.1	12.0 [BDI]	87.2 [GAB]
Trade Openness	510	33.0	20.1	6.2	110.6	6.2 [SDN]	95.1 [SYC]
Foreign Direct Investment	516	712	1378	0.031	9209	3.0 [CAF]	3866 [MOZ]
Quality of Governance Index	518	-30.7	33.3	-89.6	87.8	-85.2 [CAF]	87.8 [CPV]
Government Effectiveness	518	-0.68	-0.62	-1.84	1.04	-1.78 [CAF]	1.04 [MUS]
Political Stability	518	-0.48	0.93	-2.50	1.14	-2.16 [SDN]	1.04 [BWA]
Regulatory Quality	518	-0.60	0.60	-2.23	1.22	-1.65 [ZWE]	1.09 [MUS]
Rule of Law	518	-0.63	0.66	-1.85	1.07	-1.68 [ZWE]	0.85 [MUS]
Voice and Accountability	518	-0.52	0.73	-1.77	1.15	-1.77 [CAF]	0.96 [VCT]
Control of Corruption	518	-0.57	0.65	-1.53	1.21	-1.48 [SDN]	0.94 [CPV]
Corruption Perception Index	450	3.09	1.18	1.1	6.7	1.2 [SDN]	6.5 [VCT]

In order to provide prior knowledge between variables, a pairwise correlation was employed to the variables. Table 2 shows the correlation matrix. There is a significant and

positive relationship between the quality of governance and tax effort. The correlation is around 60%. Moreover, tax effort has a positive correlation with all of the governance indicators.   Among the other governance indicators, corruption and government effectiveness have the highest positive correlation with tax effort while the correlation of regulatory quality is relatively lower. The results also show

that the correlation between tax effort and the control variables is statistically significant, except FDI inflows. Gross domestic product per capita, industry, trade openness, urbanization, and SARAs are positively correlated with tax effort while agriculture, inflation, and foreign aid are negatively correlated.

Table 2. Correlation matrix

Variables	T/Y	QGI	Y	IND	AGR	OPEN	FDI	INF	AID	URB	SARAs	GE	PS	RQ	RL	VOA	CC	CPI
T/Y	1																	
QGI	0.60[a]	1																
Y	0.52[a]	0.60[a]	1															
IND	0.47[a]	0.06	0.51[a]	1														
AGR	-0.54[a]	-0.55[a]	-0.57[a]	-0.62[a]	1													
OPEN	0.33[a]	0.19[a]	0.57[a]	0.50[a]	-0.47[a]	1												
FDI	-0.02	0.04	0.25[a]	0.28[a]	-0.24[a]	0.20[a]	1											
INF	-0.08[c]	-0.07[c]	-0.01	0.03	-0.01	0.01	-0.02	1										
AID	-0.37[a]	-0.38[a]	-0.52[a]	-0.14[a]	0.33[a]	-0.42[a]	0.41[a]	0.01	1									
URB	0.22[a]	0.30[a]	0.61[a]	0.48[a]	-0.51[a]	0.43[a]	0.14[a]	-0.01	-0.46[a]	1								
SARAs	0.17[a]	0.20[a]	0.04	-0.12[b]	-0.07	-0.12[a]	0.22[a]	0.06	0.32[a]	-0.35[a]	1							
GE	0.62[a]	0.93[a]	0.63[a]	0.07	-0.59[a]	0.15[a]	0.10[b]	-0.04	-0.29[a]	0.21[a]	0.31[a]	1						
PS	0.55[a]	0.86[a]	0.52[a]	0.14[b]	-0.53[a]	0.31[a]	-0.06	-0.03	-0.48[a]	0.41[a]	0.06	0.70[a]	1					
RQ	0.46[a]	0.90[a]	0.54[a]	0.06	-0.49[a]	0.09[b]	0.13[a]	-0.13[a]	-0.23[a]	0.18[a]	0.23[a]	0.89[a]	0.68[a]	1				
RL	0.57[a]	0.97[a]	0.59[a]	0.04	-0.53[a]	0.16[a]	0.06	-0.08[c]	-0.35[a]	0.23[a]	0.23[a]	0.92[a]	0.80[a]	0.89[a]	1			
VOA	0.51[a]	0.87[a]	0.47[a]	-0.03	-0.41[a]	0.08[c]	0.05	-0.07[c]	-0.27[a]	0.30[a]	0.15[a]	0.77[a]	0.73[a]	0.75[a]	0.83[a]	1		
CC	0.63[a]	0.93[a]	0.56[a]	0.03	-0.52[a]	0.19[a]	-0.01	-0.06	-0.40[a]	0.27[a]	0.16[a]	0.88[a]	0.75[a]	0.80[a]	0.90[a]	0.76[a]	1	
CPI	0.64[a]	0.88[a]	0.62[a]	0.06	-0.54[a]	0.26[a]	0.05	-0.04	-0.45[a]	0.34[a]	0.18[a]	0.83[a]	0.72[a]	0.76[a]	0.85*	0.73[a]	0.92[a]	1

Notes. [a], [b], and [c] denote p<0.1, p<0.5, and p<0.10, respectively.

4. Estimation Strategy

In order to empirically investigate the relations in Eq. (1) we first used the pooled ordinary least square (POLS) estimation procedure in our analysis. A POLS model can be written as in Eq (2),

$$T/Y_{it} = \beta_{0it} + \beta_1 governance_{it} + \sum \hat{\beta} X_{it} + dummy_{it} + \varepsilon_{it} \quad (2)$$

where T/Y_{it} is a tax effort of a SSA country in year t. β_0 is constant of the equation. β_1 is the coefficient of the quality of governance (or six governance indicators). X_{it} is a vector of control variables, $dummy_{it}$ is SARAs dummy, and ε_{it} is well-behaved disturbance term. Pooled ordinary least square models assume that individual and time effects do not vary (they are homogeneous) by country and considering the same constant term for all observations. Thus, the exclusive effects of individuals and time are included in the disturbance term (ε_{it}). Moreover, POLS model is likely to suffer from omitted variables bias (Wooldridge, 2002). Although the POLS estimation gives an idea of the relations, the estimation results may be biased due to their strict assumptions.

In static panel data analysis, fixed effects (FE) or random effects (RE) estimation approaches are generally used to take into account possible individual and time effects. The RE model allows both dependent and independent variables to vary by country. Random effects models also allow time-invariant variables to be included in the model. However, one disadvantage of the RE model is that it may entail

omitted variable bias, as unobserved time-invariant country characteristics may be missing from the model. Fixed effects models consider the individual and time effects but assume that they do not vary by country. The FE models are informed exclusively by within-country comparisons, and therefore identify country-specific variation over time. A disadvantage of the FE approach is that time-invariant variables (such as the SARAs in our research model) cannot be included in these models since the analysis focuses on over-time variation. It is recommended to use the Hausman (1978) test to determine which of FE and RE is the appropriate estimator (Wooldridge, 2002; Greene, 2012). In our analysis, we applied the Hausman test to determine which of two models is appropriate. The Hausman test is a test of the null hypothesis that the RE coefficients are identical to the FE coefficients. As the p-value is not higher than the usual significance levels (1% and 5%), we rejected the null hypothesis that the differences between the coefficients are not systematic (see Appendix Table 9). Hence, the model with FE is more consistent and efficient than the RE model.

Traditional assumptions of panel data should also be valid. These are no serial correlation, no heteroscedasticity, and no cross-sectional dependence (Beck and Katz, 1995). We have applied some specification tests to examine the validity of assumptions. The heteroscedasticity and serial correlation in POLS models were examined using Lagrange multiplier (LM) heteroskedasticity test proposed by Breusch and Pagan (1980) and serial correlation test proposed by

Wooldridge (1991), respectively. Heteroscedasticity and serial correlation in FE models were examined using M-Wald test, Durbin-Watson (DW), and locally-best invariant (LBI) tests, respectively. To avoid heteroscedasticity and serial correlation problems, the null hypothesis of all tests should not be rejected (p> 0.05). In order to no serial correlation, DW and LBI statistics should be close to 2. Cross-sectional dependence (CSD) in FE models was examined using the CD-test proposed by Pesaran (2004). To avoid CSD problem in FE models, no cross-sectional dependence null hypothesis should not be rejected (p> 0.05). According to the specification tests (see Appendix Tables 9 and 10), all POLS and FE models have serial correlation and heteroscedasticity problems. But FE models do not have CSD problems. Robust standard errors in POLS and FE estimates against heteroscedasticity and serial correlation problems were obtained with the Newey-West estimator. On the other hand, depending on whether the individual (countries in our case) and time effects are statistically significant in one or both of the FE models, they may be one-way or two-way, respectively. In the analysis, the significance of the individual effects was determined using the F-test, and the significance of the time effects was determined using the likelihood ratio (LR) test. According to the results of these tests, individual effects are statistically significant in all models, while time effects are not statistically significant (see Appendix Table 10). Our estimated FE model can be written as in Eq. (3). δ_i is the fixed country-specific effects in Eq. (3).

$$T/Y_{it} = \beta_{0it} + \beta_1 governance_{it} + \sum \hat{\beta} X_{it} + dummy_{it} + \delta_i + u_{it} \quad (3)$$

To overcome the potentially biased results of the POLS and FE estimation, we have also applied GMM estimation. A GMM equation can be simply written as in Eq. (4). As can be seen, in GMM lagged dependent variable is added as an explanatory variable to the regression, and the model is given a dynamic form that is different from Eq. (2).

$$T/Y_{it} = \beta_1 T/Y_{it-1} + \beta_2 governance_{it} + \sum \hat{\beta} X_{it} + dummy_{it} + \delta_i + u_{it} \quad (4)$$

Generalized method of moments estimations diminish some constraints of static panel data models such as FE (or RE). First, the explanatory variables can be endogenous and correlated with idiosyncratic error term in FE models. The results would be inconsistent due to reverse causality. Second, omitted variables may also cause inconsistent results. Generalized method of moments produce consistent results in dynamic panel estimations and in the case of endogeneity bias (Holtz-Eakin et al., 1988; Arellano and Bond, 1991). There is a clear bidirectional causal linkage between taxation and quality of governance. Higher taxes affect governance, and governance can further increase taxes (Le et al., 2012). Taxation influences the responsiveness, accountability, and capability of states (Moore, 2007). Many previous empirical studies reveal that

an increase in tax revenues expands institutional capacity by displaying improvement in the quality of governance indicators (see for example, Altunbas and Thornton, 2011; Yi, 2012; Baskaran and Bigsten, 2013; Baskaran, 2014; Prichard et al., 2018). Moreover, high taxation could encourage tax evasion, and low tax capacity could also favor corrupt behavior (Baum et al., 2017).

Many instrumental variables approaches were proposed in the literature to overcome the endogeneity problem. In the GMM estimation method, the unobserved individual-specific effects are taken under control by creating instrumental variables that exhibit similar moment features instead of creating variables that have a high possibility of possessing endogeneity problems. Two GMM estimators that are Difference-GMM (Dif-GMM) and System-GMM (Sys-GMM) can be applied in dynamic panel data estimations. Arellano and Bond (1991) propose using first-differentiate the equation as a variable to eliminate individual-specific effects. However, Arellano and Bover (1995) and Blundell and Bond (1998) underline that this method is inadequate to limit biased results in finite sampled panels. In order to overcome this problem, the authors propose the Sys-GMM technique. Furthermore, the two-step Sys-GMM estimator proposed by Blundell and Bond (1998) presents more efficient results than one-step Sys-GMM estimator proposed by Arellano and Bover (1995) under the case of short panels (N>T) and heteroskedasticity (Blundell and Bond, 1998; Bond, 2002; Davidson and Mackinnon, 2004; Roodman, 2009). Our panel is as a short panel (N=37 ve T=14). In both of the Sys-GMM techniques, regressions systems are created in difference and in level. Regressions in the first difference instruments exist in both techniques. In this estimation technique, explanatory variables can be correlated with individual-specific effects; however, differences of variables should not be correlated with individual-specific effects. By using lagged levels of the variables as instruments, Sys-GMM techniques preserve information on cross-country differences lost when only the first differenced equation is estimated and is, therefore, more efficient (Aslaksen, 2010).

On the other hand, the consistency of Sys-GMM estimators depends on the validity of the two hypotheses. First, the instrumental variables should not be correlated with error terms. In other words, the instrumental variables should be valid. Second, first-order serial correlation (AR1) should be in the models but second-order serial correlation (AR2) should not be. This second hypothesis is tested by Arrelano-Bond (AB) test for each of AR1 and AR2 cases. Blundell and Bond (1998) draw attention that the two-step Sys-GMM procedure may cause downward biased results in the finite samples. To overcome this problem Windmeijer (2005) proposes obtaining the finite-sample robust standard errors for the variance-covariance matrix. Besides, the use of an unsuitable instrument in GMM estimations Roodman (2009) demonstrates can also give biased results. Roodman's (2009) recommendation for the optimal number of instruments is that the instruments to countries ratio should not be more

than 1%. When this ratio is greater than 1, the test loses its power. However, there is no accepted standard in the literature regarding the optimal number of instruments. In our analysis, we limited the number of instruments and applied finite-sample correction suggested by Windmeijer (2005) to obtain robust standard errors.

5. Empirical Findings

The empirical results of the POLS estimation procedure are provided in Table 3. The first eight rows of the tables show the impacts of control variables on tax effort, and subsequent rows show the impact of governance on tax effort and the descriptive statistics. Column 1 shows the impact of composite quality of governance index on tax effort; columns 2 to 8 show the estimation results which give the impact of each quality of governance indicator on tax effort. Pooled ordinary least square findings reveal that only corruption is positively associated with tax effort among the governance indicators. Accordingly, control of corruption and low corruption perception positively affect tax effort in SSA countries.

Table 3. Results of panel OLS regressions

	1	2	3	4	5	6	7	8
Y	0.148	0.709	0.542	0.174	0.104	0.152	0.514	1.288
	(2.96)	(3.17)	(2.81)	(2.99)	(3.11)	(2.94)	(2.87)	(3.23)
IND	0.271***	0.269***	0.283***	0.289***	0.284***	0.279***	0.244***	0.232***
	(.061)	(.057)	(.067)	(.059)	(.062)	(.056)	(.064)	(.075)
AGR	-0.296***	-0.295***	-0.301***	-0.315***	-0.312***	-0.311***	-0.272***	-0.309***
	(.054)	(.051)	(.052)	(.051)	(.053)	(.052)	(.058)	(.059)
OPEN	0.084**	0.086**	0.079**	0.086**	0.083**	0.083**	0.081***	0.092***
	(.030)	(.030)	(.031)	(.032)	(.032)	(.031)	(.027)	(.030)
INF	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
FDI	-1.495**	-1.459**	-1.508**	-1.522**	-1.503**	-1.479**	-1.522**	-1.522**
	(.572)	(.562)	(.580)	(.584)	(.573)	(.558)	(.584)	(.584)
AID	0.509	0.345	0.648	0.391	0.441	0.360	0.615	0.981
	(1.37)	(1.36)	(1.28)	(1.37)	(1.38)	(1.38)	(1.34)	(1.65)
URB	0.031	0.038	0.026	0.038	0.037	0.028	0.031	0.002
	(.079)	(.081)	(.082)	(.080)	(.080)	(.076)	(.076)	(.094)
SARAs	1.095	1.043	1.107	1.246	1.189	1.178	1.108	0.619
	(.949)	(.923)	(.978)	(.950)	(.975)	(.932)	(.932)	(.943)
QGI	0.023							
	(.023)							
GE		1.392						
		(1.44)						
PS			0.630					
			(.646)					
RQ				0.628				
				(1.07)				
RL					0.625			
					(1.22)			
VOA						0.563		
						(.999)		
CC							2.232**	
							(1.08)	
CPI								1.241***
								(.401)
Constant	24.1	27.0	21.3	25.6	24.8	24.8	23.6	19.5
Obs.	434	434	434	434	434	434	434	434
N. of Countries	34	34	34	34	34	34	34	31
F-test	46.4***	46.5***	49.3***	51.1***	47.9***	47.2***	45.8***	60.7***
R-sq.	59.6	59.7	59.4	59.2	59.2	59.2	61.0	59.9

Notes: ***, and ** denote statistical significance at the 1%, and 5% levels, respectively. (…) is show the Newey-West robust standard errors.

When the results regarding the relationship between control variables and tax effort are examined, GDP per capita, foreign aid, urbanization, and SARAs have a positive impact on tax effort, but these effects are not statistically significant. According to the findings, industry and trade openness have positively and statistically significant impact on tax effort, while agriculture, FDI inflows, and inflation have negatively and statistically significant impact. On the other hand, according to F-test, all models are statistically significant, and according to R-square values the explanation rate of independent variables to tax effort is about 60%.

As highlighted above, the POLS estimation procedure assumes that country-specific effects are constant. In our analysis, we applied the FE model estimation to control country-specific effects. Fixed effects estimation results are presented in Table 4. As seen, when country-specific effects are taken into consideration more evidence has been obtained especially on the governance and tax effort relationship contrary to POLS estimation results. According to the findings, in addition to corruption, the impacts of composite quality of governance index, government effectiveness, and political stability on tax effort are positive and statistically significant. In contrast, the relationship between regulatory quality, the rule of law and voice,

accountability, and tax effort is not statistically significant in FE estimation.

The findings in the relationship between economic variables and tax effort are similar with the POLS estimation. The effect of GDP per capita, foreign aid, and urbanization on tax effort is not statistically significant. According to the findings, industry and trade openness are positively associated with tax effort. Agriculture, FDI inflows, and inflation negatively affect tax effort. Also, according to the F-test results, all models are statistically significant and according to R-square values the explanation rate of independent variables to tax effort is about 30%.

Table 4. Results of panel Fixed Effects regressions

	1	2	3	4	5	6	7	8
Y	0.397	1.09	1.05	0.536	0.573	0.603	0.280	1.24
	(1.32)	(1.37)	(1.30)	(1.34)	(1.37)	(1.31)	(1.29)	(1.55)
IND	0.258***	0.256***	0.271***	0.276***	0.271***	0.265***	0.231***	0.231***
	(.027)	(.028)	(.024)	(.026)	(.029)	(.026)	(.028)	(.026)
AGR	-0.287***	-0.287***	-0.292***	-0.308***	-0.304***	-0.300***	-0.264***	-0.308***
	(.036)	(.035)	(.029)	(.033)	(.036)	(.033)	(.035)	(.035)
OPEN	0.085***	0.087***	0.079***	0.086***	0.084***	0.084***	0.081***	0.092***
	(.016)	(.017)	(.017)	(.018)	(.017)	(.016)	(.015)	(.018)
INF	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***
	(.0001)	(.0001)	(.0000)	(.0000)	(.0000)	(.0000)	(.0000)	(.0000)
FDI	-1.38***	-1.33***	-1.42***	-1.39***	-1.38***	-1.39***	-1.32***	-1.47***
	(.385)	(.384)	(.384)	(.382)	(.383)	(.382)	(.384)	(.549)
AID	0.408	0.210	0.604	0.255	0.308	0.268	0.511	0.974
	(.651)	(.645)	(.646)	(.652)	(.654)	(.648)	(.638)	(.856)
URB	0.036	0.041	0.032	0.041	0.040	0.035	0.034	0.037
	(.035)	(.036)	(.037)	(.035)	(.035)	(.034)	(.034)	(.035)
QGI	0.024**							
	(.012)							
GE.		1.36*						
		(.791)						
PS			0.728**					
			(.353)					
RQ				0.589				
				(.749)				
RL					0.614			
					(.776)			
VOA						0.728		
						(.620)		
CC							2.28***	
							(.722)	
CPI								1.25***
								(.296)
Constant	23.9***	26.7***	20.5***	25.3***	24.6***	24.5***	23.4***	19.5*
Country Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Effect	No	No	No	No	No	No	No	No
F-test	48.30***	47.65***	48.61***	48.76***	48.34***	48.34***	53.12***	55.06***
R-sq.	27.20	27.50	27.50	27.50	27.50	29.40	27.70	33.90

Notes: ***, and ** denote statistical significance at the 1%, and 5% levels, respectively. (…) is show the Newey-West robust standard errors.

Fixed effects models cannot comprehend the possible endogeneity cases between the governance and tax effort. That is why, in order to obtain more consistent results, we have re-estimated our research models by employing the two-step Sys-GMM estimation procedure proposed by Blundell and Bond (1998). The findings of GMM

estimations are presented in Table 5. The specification tests demonstrate that the assumptions of GMM estimations are valid. According to probability values of Wald statistics all of the models are statistically significant. AB test shows no second-order serial correlation in all models, while the

Sargan test demonstrates that instrument variables are valid in all models.

Generalized method of moments estimates show remarkably distinct outcomes, according to POLS and FE estimation results. The findings provide more empirical evidence and the estimated coefficients also differ. According to the findings, the relationship between tax effort and the composite quality of governance index along with all governance indicators is positive and statistically significant. These findings are consistent with recent literature suggesting that quality of governance and its components enhance tax effort in developing countries (see for example, Ajaz and Ahmad, 2010; Le et al., 2012; Bird et al., 2014; Lien, 2015; Epaphra and Massawe, 2017; Arif and Rawat, 2018). It is also seen that an 1% increase in governance quality increases tax effort of more than 1% (β=0.032 and $\Delta\cong1.6$) in SSA countries. Unlike POLS and FE results, GMM estimation results show that all governance indicators are positively associated with tax effort. Among others voice and accountability, the rule of law, and regulatory quality relatively have the highest positive effects on tax effort. These governance indicators are followed by control of corruption, government effectiveness, and political stability. This result differs from the previous literature. Many previous studies (among others, Ghura, 1998; Gupta, 2007; Thornton, 2008; Pessino and Fenechietto, 2010; Lien, 2015; Baum et al., 2017; Epaphra and Massawe, 2017) show that control of corruption and bureaucracy quality are more associated with tax effort. Generalized method of moments findings draw attention to the fact that the state of law and democracy are relatively more important, although it does not deny the importance of public bureaucracy in increasing tax effort. On the other hand, an increase in GDP per capita increases tax effort as expected. This finding, among others, is similar with Ghura (2018), Eltony (2002), Gupta (2004), Le et al. (2012), Ayenew (2016), Bird et al. (2014), and Mawejje (2019) who show the positive impacts of GDP per capita on tax effort. It can be claimed that the increases of GDP per capita, which is the primary indicator of economic development, increase tax effort in African economies, through increasing tax effort and efficiency in tax administration. Still, compatible with the expectations, our empirical findings support the results of previous researches regarding industrialization have a positive impact on tax effort while the impacts of agricultural sectors are negative (among others, Chelliah, 1971; Tanzi, 1992; Ghura, 1998; Piancastelli, 2001; Ayenew, 2006; Gupta, 2007; Mawejje, 2019). In African economies where the share of the agricultural sector is relatively high, and income is earned predominantly from agriculture, it is common for agriculture to have a negative impact on tax effort because taxation of agriculture is relatively strict. It can be point out that industrialization in African countries has contributed to tax effort by increasing the tax base and economic development. On the other hand, the negative impact of agriculture is more than the positive impact of industrialization.

Findings show that trade openness has a positive effect on tax effort. It can be claimed that trade openness increases tax revenues due to the easy taxation and positive association with economic growth. This result is consistent with the results of many previous studies (Leuthold, 1991; Stotsky and WoldeMariam, 1997; Piancastelli, 2001; Elthony, 2002; Bahl, 2004; Le et al., 2012; Mawejje, 2019). Findings present strong evidence, in all models, that countries with SARAs have a more successful tax effort compared to the countries which have no SARAs. On the contrary to Ahlerup et al. (2015), Sarr (2016), and Dom (2019) who have presented skeptical evidence towards these administrations, our finding is similar with Ade et al. (2010), von Haldenwang et al. (2014), and Ebeke (2016) who show the positive impacts of SARAs on tax revenue performance. Therefore, this result indicates that the administrative reforms of in the revenue administrations in African countries are thriving. As expected, the impact of inflation on tax effort is negative. However, the negative impact of inflation is not high. The small impact can be attributed to the low tax burden in African. The low tax burden causes the low tax erosion due to inflation. This finding is consistent with many previous results (Ghura, 1998; Agbeyegbe et al., 2006; Ayenew, 2016; Epaphra and Massawe, 2017). Our findings reveal an uncertain result on the relationship between tax effort and FDI inflows. According to the findings, the positive relationship between FDI and tax effort is not statistically significant for the five estimation models. In the two estimation models, statistical significance is valid only at a low confidence interval. Therefore, GMM estimation findings reveal an ambiguous situation, as in previous literature (among others, Mahmood and Chaudry, 2013; Jeza et al., 2016; Pratomo, 2019; Mawejje, 2019), which reached conflicting conclusions regarding the relationship between FDI and tax effort. It is far from providing clear results for their countries. Findings also show that there is no significant relationship between tax effort and foreign aid. This result is consistent with Agbeyegbe et al. (2006), Teera and Hudson (2004), and Addison and Levin (2012), who have presented skeptical evidence of the relationship between foreign aid and tax effort. Finally, similar to the results of Addison and Levin (2012), the findings of this study also show that urbanization has no significant effect on tax effort in African countries where the rural population density is high and sufficient labor mobilization is not achieved.

Table 5. Results of two-step Sys-GMM regressions

	1	2	3	4	5	6	7	8
T/Y_{t-1}	0.520***	0.544***	0.578***	0.503***	0.560***	0.539***	0.531***	0.512***
	(.030)	(.034)	(.027)	(.025)	(.024)	(.022)	(.022)	(.016)
Y	0.507***	0.457***	0.349***	0.475***	0.330***	0.460***	0.455***	0.250***
	(.093)	(.075)	(.054)	(.083)	(.065)	(.058)	(.073)	(.054)
IND	0.104***	0.102***	0.089***	0.121***	0.108***	0.080***	0.114***	0.103***
	(.013)	(.017)	(.015)	(.016)	(.015)	(.016)	(.010)	(.012)
AGR	-0.052**	-0.061**	-0.050**	-0.073***	-0.089***	-0.039*	-0.066**	-0.048**
	(.024)	(.027)	(.025)	(.020)	(.026)	(.021)	(.023)	(.020)
OPEN	0.035***	0.032***	0.027***	0.035***	0.037***	0.025***	0.036***	0.035***
	(.004)	(.006)	(.005)	(.005)	(.004)	(.006)	(.004)	(.003)
INF	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002**
	(.001)	(.001)	(.001)	(.000)	(.000)	(.000)	(.000)	(.001)
FDI	0.259	0.313*	0.066	0.336**	0.248*	0.282	0.209	0.070
	(.198)	(.163)	(.230)	(.155)	(.153)	(.216)	(.202)	(.092)
AID	0.411	0.454	0.300	0.181	0.233	0.281	0.170	0.043
	(.333)	(.317)	(.207)	(.310)	(.292)	(.209)	(.255)	(.154)
URB	0.029	0.003	0.004	0.011	0.029**	0.023	0.046	0.030
	(.031)	(.015)	(.018)	(.018)	(.012)	(.015)	(.032)	(.022)
SARAs	1.68***	1.62***	1.55***	1.23***	1.20***	2.49***	1.52***	3.87***
	(.489)	(.465)	(.318)	(.323)	(.328)	(.335)	(.436)	(.491)
QGI	0.032***							
	(.005)							
GE		0.887**						
		(.399)						
PS			0.309***					
			(.073)					
RQ				1.28***				
				(.284)				
RL					1.42***			
					(.525)			
VOA						3.17***		
						(.276)		
CC							1.00*	
							(.569)	
CPI								0.331***
								(.092)
N. of Countries	37	37	37	37	37	37	37	31
N. of Instrument	25	25	25	25	25	25	25	14
Wald [Prob.]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
AR(1)	-2.62**	-2.49**	-2.63**	-2.26**	-2.67**	-2.72**	-2.44**	-2.77**
	[0.008]	[0.012]	[0.009]	[0.023]	[0.007]	[0.006]	[0.015]	[0.005]
AR(2)	-1.23	-1.26	-1.19	-1.23	-1.29	-1.05	-1.21	-1.14
	[0.216]	[0.205]	[0.231]	[0.217]	[0.198]	[0.293]	[0.227]	[0.250]
Sargan (χ^2)	26.01	30.75	25.44	26.22	21.42	29.30	29.43	32.41
	[1.00]	[1.00]	[1.00]	[1.00]	[1.00]	[1.00]	[1.00]	[0.88]

Notes: ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. The results are from two-step Sys-GMM estimation with Windmeijer (2005) robust correction. (….) are the corrected standard errors. […] is the probability of Wald, AB, and Sargan test statistics.

6. Conclusion and Policy Implications

Sub-Saharan African countries have not sufficient income to support the increasing demands for service delivery and investments in physical capital. The mobilization of public revenues is very low in SSA countries, due to several economic and institutional problems. Moreover, SSA countries are often characterized by the insufficient providing of public goods, large-scale debts, and excessive dependency on foreign aid or grants due to their low institutional capacities. Increasing tax revenue mobilization to dispose of resource dependence, reducing public deficits, and alleviating foreign dependency is a vital part of economic development goals in SSA countries. However, it is challenging for governments to interfere with the structural determinants of tax effort in the short term. Nevertheless, governance issues such as high patronage, inadequate representation, transparency and accountability, political instability, ineffective public bureaucracy, and widespread corruption remain their priority in the political agenda of SSA countries.

Many studies have shown that governance quality is associated with lower tax effort in emerging economies. Previous studies emphasized that various governance indicators have an impact on tax effort and the improvement in these indicators causes high tax effort. There is an extensive literature showing that corruption damages trust in tax offices, increases tax rates and seigniorage, and clearly has a negative impact on tax effort. Additionally, tax collection depends positively on institutional capacity so the effectiveness of public bureaucracy and the government to explain the institutional determinants of tax effort in developing countries and SSA. Theoretical and empirical considerations suggest that higher political instability and non-effective public management brings lower tax effort. Furthermore, some democratic elements such as freedom of speech, accountability and transparency are also associated with tax revenue.

In this study, we analyzed the impact of governance on tax effort in 37 SSA countries by using panel ordinary least square, fixed effect, and two-step Sys-GMM estimation methods cover the period 2002-2015. Our robust empirical findings show that governance and all of the governance indicators positively affect tax effort in SSA countries. This result indicates that governance is an inevitable factor to increase tax effort in SSA countries. We also checked the impact of several structural factors such as GDP per capita, industry, agriculture, inflation, foreign aid, urbanization, trade openness, FDI and SARAs on tax effort. According to empirical results, tax effort is positively correlated with GDP per capita, industrialization, trade openness and SARAs while negatively correlated with agriculture, and inflation. Also, according to empirical results, while there is no significant relationship between foreign aid and urbanization and tax effort, different estimates of the relationship between FDI inflows and tax effort are far from offering a common result.

As expected, the phenomenon of high quality of governance implies responsible and accountable government, trust in government, high tax compliance, the establishment of a fiscal bargaining equilibrium between the citizen and the state, and an efficient public bureaucracy. Our empirical findings reveal that the undeniable fact of governance indicators represent efficiency and effectiveness, such as bureaucracy quality, control of corruption, regulatory quality, government effectiveness, and political stability in increasing tax effort in SSA countries. Findings also show that representations of state-building and democracy, such as voice and accountability and the rule of law are relatively more important to increase tax effort.

The findings of the study highlight some policy recommendations. The results suggest that tax revenues could rise if corruption falls in SSA countries. Sub-Saharan Africa countries need to adopt effective strategies against corruption that causes erosion in tax revenues. Furthermore, efforts that enhance the other indicators of governance will lead to higher tax effort in SSA countries. Political and institutional capacity reforms can play an important role in increasing tax effort. Reforms that advance better governance are also central to ending aid dependency by increasing tax effort in SSA countries. Besides, increasing industrialization and trade openness while reducing agriculture share, and inflation would be expected to enhance tax effort.

This research largely cooperates with previous literature. The main contribution of this study is that, distinctly from the results of previous studies, it provides clear evidence regarding the significance of the state of law and democracy in order to increase tax effort in SSA countries. The state of law and democracy are vital for higher tax effort. As can be seen from the experience of an advanced democracy, there is a mutual linkage between democracy, law, rights, and taxes. Law and democracy offer higher governance quality to increase tax effort by promoting transparency and accountability. However, this study does not explicitly explain how the state of law and democracy affect tax effort in SSA countries. In addition, the panel data analyzes of this study do not empirically explain which governance indicator is effective in tax effort for each country. Further research is needed to provide deeper insights into how the state of law and democracy affect tax effort in SSA countries. With heterogeneity panel data analysis, the effects of governance indicators on tax effort in each SSA country can be estimated separately.

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Appendix

Table 6. A brief empirical literature on the relationship between governance and tax effort

Study	Sample	Time	Method	Results
Ghura (1998)	39 SSA countries	1985-1996	OLS	An increase in the level of corruption lowers tax revenue.
Tanzi and Davoodi (2000)	83 countries	1980-1997	OLS	An increase in the level of corruption perception decrease tax revenue.
Bird et al. (2014)	102 countries	2003	Cross-section OLS	ICRG's composite index of institutional quality and all indicators of World Governance are positively associated with tax effort.
Aizenman and JinJarak (2005)	40 countries	1970-1999	OLS	A one standard deviation increases in the durability of the political regime, and in the regulation of political participation, raises the value added tax efficiency.
Gupta (2007)	105 developing countries	1980-2004	GMM	Control of corruption and political stability positively affect tax revenues
Imam and Jacobs (2007)	12 MENA countries	1990-2003	Sys-GMM	Corruption does not have a statistically significant impact on total tax revenue.
Thornton (2008)	40 SSA and 14 MENA countries	1984-2001 (mean)	Cross-section OLS	A decrease in the level of control of corruption positively affects tax revenue.
Bornhorst et al. (2009)	30 countries	1992-2005	Fixed Effect	Corruption negatively affects non-hydrocarbon revenue
Pessino and Fenochietto (2010)	96 countries	1991-2006	Stochastic frontier tax analysis	Corruption negatively affects tax effort.
Potanlar et al. (2010)	27 developing countries	2002-2006	GMM	An increase in the level of corruption perception decrease tax effort
Ajaz and Ahmad (2010)	25 developing countries	1990-2005	GMM	Tax revenue increase when quality of governance increase and corruption perception decrease
Le et al. (2012)	110 developing and developed countries	1994-2009	2SLS	High quality of bureaucracy and low corruption are more associated with tax effort.
Botlhole et al. (2012)	45 SSA countries	1990-2017	2SLS	ICRG's composite index of institutional quality positively affects tax revenue.
Lien (2015)	82 developing countries	1996-2013	Dif-GMM	All of governance indicators are positively associated with tax revenue in developing countries. Among others, RQ, CC, and GE are more affective on tax revenue in LICs, respectively. Among others, GE, VOA, and RQ are more affective on tax revenue in lower-MICs, respectively.
Baum et al. (2017)	147 developing and advanced countries	1995-20014	GMM	Corruption negatively affect tax revenue performance
Epaphra and Massawe (2017)	30 African countries	1996-2016	Random Effect	All indicators of quality of governance positively affect tax revenue performance. Control of corruption and government effectiveness are more associated with tax revenue performance.
Topal and Sahin (2017)	34 OECD countries	1996-2014	CCE-MG	The quality of governance positively affects tax revenue in only 15 of 34 OECD countries.
Arif and Rawat (2018)	10 emerging & growth-leading economies	2001-2015	PMG	Tax revenue performance increase when quality of governance increase and corruption perception decrease
Mawejje (2019)	31 SSA countries	2003-2015	Random Effect	An increase in the level of voice and accountability increases tax revenue. Corruption does not have a statistically significant impact on total tax revenue.

Table 7. List of Sub-Saharan African (SSA) countries in sample

Country	Income Group (2015)	SARAs	Quality of Governance Rank (2015)	
			In Sample	In World
Benin [BEN]	Low-income	No	10	122
Botswana [BWA]	Upper middle-income	No	3	50
Burkina Faso [BFA]	Low-income	No	12	131
Burundi [BDI]	Low-income	No	32	184
Cameroon [CMR]	Lower middle-income	No	22	156
Cape Verde [CPV]	Upper middle-income	No	1	9
Central African Rep. [CAF]	Low-income	No	37	197
Chad [TCD]	Low income	No	34	187
Congo, Dem. Rep. [ZAR]	Low-income	No	35	193
Congo, Rep. [COG]	Lower middle-income	No	29	177
Ethiopia [ETH]	Low-income	Yes	26	171
Gabon [GAB]	Upper middle-income	No	18	142
Gambia, The [GMB]	Low-income	No	21	153
Guinea [GIN]	Low-income	No	28	174
Guinea-Bissau [GNB]	Low-income	No	31	182
Kenya [KEN]	Lower middle-income	Yes	16	139
Liberia [LBR]	Low-income	No	25	165
Madagascar [MDG]	Low-income	No	23	157
Malawi [MWI]	Low-income	Yes	13	133
Mauritania [MRT]	Lower middle-income	No	27	172
Mauritius [MUS]	Upper middle-income	No	2	40
Mozambique [MOZ]	Low-income	No	20	147
Nigeria [NGA]	Lower middle-income	No	30	180
Rwanda [RWA]	Low-income	Yes	7	89
São Tomé and Principle [STP]	Lower middle-income	No	11	123
Senegal [SEN]	Lower middle-income	No	8	94
Seychelles [SYC]	High-income	No	5	68
Sierra Leone [SLE]	Low-income	Yes	19	146
South Africa [ZAF]	Upper middle-income	Yes	6	75
St. Vincent and T. G. [VCT]	Upper middle-income	No	4	54
Sudan [SDN]	Lower middle-income	No	36	196
Swaziland [SWZ]	Lower middle-income	No	15	137
Tanzania [TZA]	Low-income	Yes	14	134
Togo [TGO]	Low-income	No	24	159
Uganda [UGA]	Low-income	Yes	17	140
Zambia [ZMB]	Lower middle-income	Yes	9	117
Zimbabwe [ZWE]	Low-income	Yes	33	186

Sources: WDI (2018), Sarr (2016), WGI (2018), Topal and Sahin (2017).

Table 8. Data description and data sources

Variables	Symbol	Short Description	Sources
Tax Effort	T/Y	Total tax revenue to GDP ratio (per cent)	ICTD-GRD (2018)
GDP per capita	Y	GDP per capita (constant, logarithmic form used)	World Development Indicators (WDI, 2019)
Industry	IND	Value added of industry in total output (per cent)	
Agriculture	AGR	Value added of agriculture in total output (per cent)	
Inflation	INF	Inflation as measured by the consumer price index reflects the annual percentage change (per cent)	
Foreign Aid	AID	Net official aid refers to aid flows (net of repayments) from official donors to countries and territories. (constant, million dollars, logarithmic form used)	
Urbanisation	URB	Urban population to total population ratio (per cent)	
Trade Openness	$OPEN$	Openness is the sum of exports and imports of goods and services measured as a share of gross domestic product (per cent)	UNCTAD (2018)
Foreign Direct Investment	FDI	Foreign direct investment inward flows (constant, million dollars, logarithmic form used)	
SARAs	$SARAs$	Semi-autonomous revenue authorities (0: No, 1: Yes)	Sarr (2016)
Quality of Governance	QGI	Quality of Governance Index is a composite index include government effectiveness, political stability and absences of violence, regulatory quality, rule of law and control of corruption, voice	Topal and Sahin (2017)

Index		and accountability [from -100 (poor quality) to 100 (perfect quality)]	
Government Effectiveness	GE	GE capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.(from -2.5 to 2.5 scale)	
Political Stability	PS	PS capturing perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.(from -2.5 to 2.5 scale)	
Regulatory Quality	RQ	RQ capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development (from -2.5 to 2.5 scale)	World Governance Indicators (WGI, 2018)
Rule of Law	RL	RL capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.(from -2.5 to 2.5 scale)	
Voice and Accountability	VOA	VOA capturing perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media(from -2.5 to 2.5 scale)	
Control of Corruption	CC	CC capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as capture of the state by elites and private interests (from - 2.5 to 2.5 scale)	
Corruption Perception Index	CPI	CPI is a compound index which is prepared by compiling the corruption data obtained from operational reports and experts in several independent and reliable institutions[rescaled from 0 (highly corrupt) to 10 (very clean)]	Transparency International (2018)

Table 9. Results of diagnostic tests for Pooled OLS regressions

Model & Test	Heteroscedasticity	Serial-Correlation
	Breusch-Pagan test	Woolridge-test
1	32.83***	227.46***
2	30.17***	256.97***
3	27.81***	270.93***
4	27.84***	234.20***
5	29.21***	271.81***
6	28.40***	210.91***
7	29.76***	267.15***
8	18.28***	43.43***

Note: *** denotes p<0.01.

Table 10. Results of diagnostic tests for Fixed Effects regressions

Model & Test	Individual & time specific effect		Model$^\lambda$	Heteroscedasticity	Serial-correlation		CSD
	F-test	LR-test	Hausman	M-Wald test	DW	LBI	CD-test
1	30.12***	1.13	50.22***	21106.1***	1.00	1.14	-0.774
2	29.93***	1.91	63.39***	20754.9***	1.00	1.14	-0.445
3	30.17***	0.38	37.47***	21135.6***	1.00	1.14	-0.518
4	30.41***	0.44	80.04***	20131.2***	1.00	1.14	-0.410
5	30.43***	0.33	74.50***	20383.9***	1.00	1.14	-0.366
6	31.56***	0.43	65.98***	20322.7***	1.02	1.15	-0.609
7	28.60***	0.77	58.81***	20914.0***	1.01	1.15	-0.286
8	28.77***	0.00	45.46***	29327.0***	0.94	1.17	-0.173

Note: *** denotes p<0.01, λ: optimal model. LR: Likelihood Ratio, M-Wald: Modified Wald, DW: Durbin-Watson statistics, LBI: locally best invariant test statistics, CSD (or CD): Cross-sectional dependence.