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An Estimation of the Taxable Capacity, Tax Effort and Tax Burden of an Emerging Economy: Evidence from Ghana

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ABSTRACT

This paper estimates taxable capacity, tax effort and tax burden with a view to examining the tax fairness perceptions and tax system efficiency. The study employed ordinary least squares regression and vector autoregressive model for historical time series data sourced from the World Development Indicators and Bank of Ghana. We found that Ghana's overall tax burden and average post-tax reform efforts are low suggesting tax fairness and tax system inefficiency respectively. We conclude that post-tax reform dispensation has not generated the much-needed tax revenues because of low tax efforts. Thus, tax revenue could be significantly maximized to aid the achievement of the sustainable development goals to move Ghana Beyond Aid. This paper extends literature by relying on estimates of taxable capacity, tax effort and tax burden to assess the tax fairness perceptions and tax administrative efficiency of an emerging economy. We posit that these triad terminologies move pari passu in assessing the efficiency and fairness of a country's tax system. We recommend that embarking on jurisdictional tax reforms should not only be about appropriate and a plethora of tax laws and multiplicity of taxes but also on the efficiency and integrity of tax administration. The judicious use and prompt accountability of tax revenues could help address tax unfairness perceptions in emerging economies.

Keywords: Taxable capacity, Tax effort, Tax burden, Fairness, Ghana, Tax revenue
JEL Classifications: H2, Q2, Q3

1. INTRODUCTION

The significance of public revenues to underdeveloped and emerging economies cannot be discounted if their dreams of achieving accelerated economic progress would be realized (Kaldor, 1963). Thus, driving tax revenues is pivotal to the achievement of sustainable development goals of emerging economies.

In view of this, during the 1960s and early 1970s, considerable research spotlight was directed at investigating these tax related issues in developing countries, most of which were spearheaded by economists such as Lotz and Morss (1967), Chelliah (1971), Bahl (1971), Chelliah et al. (1975), Tait, et al. (1979) and Howard (2011). Some were in an attempt to support donors and international lending agencies in their assessment of the fiscal performance of governments of recipient countries (Organisation for Economic Co-operation and Development (OECD, 2011)). In connection with this, there are three key indicators of tax revenue performance: Taxable capacity, tax burden and tax effort.

Gaspar et al. (2006) noted that taxable capacity is closely linked to the process of economic development and growth. Pessino and Fenochietto (2013) define taxable capacity as the maximum level of tax revenue that a country can achieve. Entin (2004) explains that tax burden is an economic impact caused by taxation and reflects the reactions of taxpayers because of this tax deduction, whiles Leuthold (1991) defines tax effort as the exertion a country puts into collecting its tax revenue, given its tax handles.

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Though tax revenues account for most of government's revenue in the majority of African countries, they do not generate enough to cater for government expenditure. In 2015, Ghana's tax revenue was 79.1% of total government revenue. In the same year, tax revenue as a percentage of gross domestic product (GDP) was 19.3%, which was far lower than the total government expenditure of 23.8% of GDP for the same period (Bank of Ghana, (BoG) 2015). Thus, governments' need for additional revenue is considerable in many emerging economies.

Currently, there is a renaissance in domestic resource mobilisation in many emerging economies (African Development Bank (AfDB), 2010a; International Monetary Fund (IMF, 2011; Drummond et al. (2012), which topped the list of action areas in the outcome document that emerged from the 3rd Financing for Development conference held in Addis Ababa in July 2015 (United Nations, 2015)).

However, the way these countries raise revenues could have far reaching consequences. For example, increasing revenue by overburdening the already compliant taxpayers with multiplicity of taxes (Amoh and Adom, 2017) can exacerbate distortions and perceived inequalities in the distribution of the tax burden. More so, all efforts to increase tax revenue could be an exercise in futility if government's spending is not checked or matched with expected revenue inflows.

Though extant literature has assessed the role of taxable capacity, tax effort and tax burden in revenue generation and the efficiency of tax administration, the linkage to tax fairness perceptions has been overlooked. This gap motivated the study.

Again, except for few notable research works on taxable capacity in specific single case countries and provinces in Indonesia (Alfirman, 2003), Iran (Yahyaee, 1991), Hamedan province (Nikoo, 1996) and Ghana (Brafu-Insaidoo and Obeng, 2016) which have proved beneficial for tax policy initiatives, the bulk of the related studies have been cross-sectional (see Le et al. (2012); and Bird et al. (2008)) with mixed results.

The justification for a single country study of as one of the pioneering studies is due to the following reasons. Firstly, the cross-country comparisons, which have characterised some studies of this nature, have attracted criticisms. Secondly, there could be errors in variables selection, which could eclipse the complex interrelationship between government revenue and other revenue triggering factors. Again, national aggregates, such as per capita incomes, which are normally employed in those estimations, are rough estimates and tax information is often extracted from widely differing practices across countries, which cannot satisfactorily be placed on a comparable basis.

Further, the uniqueness and timing of the pre-tax reform and post-tax reform dispensations with an intervening political instability of 1981 motivates the choice of Ghana for study. The study would make a comparison of the pre-tax reform and post-tax reform periods for tax policy decision making.

Finally, there is the perennial effect of socio-economic factors such as the increasing budget deficits, public outcry over high and many different types of taxes, perceived tax unfairness, high levels of tax evasion, high levels of public debt and corruption.

Therefore, there is the need to examine the determinants of taxable capacity, tax effort and tax burden, and to compute them quantitatively, to provide insights in addressing tax fairness perceptions and tax administration efficiency challenges. It is therefore hypothesized that:

- H_1. The taxable capacity (tax potential) in Ghana is more than the actual tax revenue.
- H_2. The overall tax burden in Ghana is high.

In this study, the ordinary least squares regression and vector autoregressive (VAR) models for historical time series data sourced from the World Development Indicators (WDI) and BoG covering the period 1970 to 2015 were employed to test the hypotheses.

This research adds to literature by computing taxable capacity, tax effort and tax burden to assess the tax fairness perceptions and tax administrative efficiency of an emerging economy.

A test of the first hypothesis revealed unexploited tax revenue potential in Ghana. The second hypothesis showed that tax burden is within taxpayers' ability to pay because of low tax efforts, an implication that the overall tax burden in Ghana is not high.

We conclude that post-tax reforms have not generated the required tax revenue due to low tax efforts and the low tax burden index suggests a fair tax system. We postulate that the triad terminologies move pari passu in assessing the efficiency and fairness of a country's tax system.

The remainder of the paper is organised as follows: The second section presents a review of related literature. The third section presents the methods and estimation techniques. The fourth section discusses the empirical findings of the study. Finally, the fifth section concludes.

2. LITERATURE REVIEW

This section discusses key concepts of taxable capacity, tax burden and tax effort and the factors influencing them.

2.1. Taxable Capacity

Taxable capacity is a dicey and elusive concept (Mirrlees, 2010) and difficult to define because opinions differ widely at different times and in different contexts (Toye, 1978). According to Howard (2011), taxable capacity is the amount of tax, which could be justly or fairly imposed on a country. Pessino and Fenochietto (2013) define tax capacity as the maximum level of tax revenue that a country can achieve.

Taxable capacity depends on the ability of the people to pay tax and the ability of the government to collect (Malik, 2010) and could be split into two types (Bahl, 1971; Gupta, 2007): Absolute taxable capacity and relative taxable capacity. Bahl (1971) defined relative taxable capacity as the achievable tax ratio when a country

applies to its variant tax bases, a group of mean effective rates calculated as net regression coefficient. Gupta (2007) explained that absolute taxable capacity is the surplus of production over the minimum volume of production per head of the population, keeping the essential standard of living unchanged over a number of years. He further stated that relative taxable capacity is the extent of tax burden that should be imposed on different persons to finance a common expenditure.

The initial attempt to statistically compute taxable capacity was introduced by Martin and Lewis (1956). They examined the trends in taxation of different countries at different stages of economic development using a tax ratio; the ratio of total tax revenues to GDP or gross national product (GNP). The findings of their study suggest that the higher the income, the degree of openness, the level and degree of industrialization and the level of urbanization, the higher the overall tax ratio of a tax jurisdiction would be.

Musgrave (1959) handled the concept of taxable capacity rather theoretically. He emphasised the relevance of relative taxable capacity, which he estimated by comparing different countries or sub-national units in a federation. His argument was that taxable capacity of different units in a federation could be estimated by estimating the 'average' behaviour of the states in raising revenues after allowing for economic factors that can cause differences in taxable capacity.

Subsequently, most studies on the subject agree that measuring taxable capacity must be achieved through finding the expected or potential ratio of tax to GNP and through the use of a regression equation of the actual tax burden on a variety of factors influencing it (Le et al., 2008). Thus, taxable capacity is the predicted tax/GDP ratio estimated from a regression model, taking into account a country's specific characteristics and other variables (Le et al., 2008; Truong and Gash, 1979; Le et al., 2008; Le et al., 2012).

The regression approach is an improvement over the traditional tax effort measures (tax/income ratio) where income is used as a measure of taxable capacity. It establishes that in addition to aggregate income, which is the denominator in the tax ratio, other factors affect a country's taxable capacity. This study therefore adopted the relative taxable capacity approach because it is more accurate and its estimation has gained significant attention (Prest, 1978).

2.2. Tax Burden

De Santis et al. (2001) describe tax burden as representing the wider indicator of the role of taxation in a country's economy, which mirrors the entire tax burden borne by households and firms. Entin (2004) maintains that tax burden is an economic impact caused by taxation and reflects the reactions of taxpayers because of this tax deduction. Black (1997) defined tax burden as the burden to which an entire society is subjected to, in terms of tax cost.

Prior researchers agree that tax burden can be measured quantitatively as a share of GDP, (Baer and Galvao, 2005). Daxon and Enevoldsen (1998) suggested a measure of the tax burden per capita. The IMF employed three methods as follows:

1. Tax burden = Total tax revenues/GNP,
2. Tax burden = Total tax revenues/per capita income, and
3. Tax burden = Total tax revenues/size of the foreign trade.

Marar and El-hindi (1980) used the third method to compute tax burden. The measures of tax burden are indicators of how efficient tax policy meets one of its primary goals of equitably raising the revenues needed to run a tax jurisdiction.

In assessing the tax burden and taxable capacity, Toye (1978) provided a typology as displayed in Table 1, which will serve as a guide for tax policy classification of any country.

In estimating Ghana's tax burden quantitatively, the study adopted the model used in Brazil by Baer and Galvao (2005), which is the total tax revenue as a percentage of GDP.

In summary, tax becomes a burden because it reduces taxpayer's income. Tax burden thus answers broad economic and social questions about the effect of tax policy on the distribution of income and wealth.

2.3. Tax Effort

Prior literature recognizes the essential role of tax effort in assessing the ability of both the individual and the national economy to bear the tax burden at different periods, thereby helping to make decisions regarding the imposition of new taxes or the changing of tax rates (Malik, 2010).

Tax effort is an index of the ratio between the share of the actual tax collection in GDP and the predicted taxable capacity obtained from a regression model. Leuthold (1991) defined tax effort as the exertion a country puts into collecting its tax revenue, given the available tax handles. According to Gillis (1989), tax effort is the extent to which a country utilizes its taxable capacity. Thus, it is the ratio of actual tax revenues to taxable capacity. In other words, the tax effort can be measured by dividing the tax burden by the taxable capacity (Le et al., 2008). Stotsky and Wolde Mariam (1997) explained that tax effort index is the ratio of the actual tax share to the predicted (or potential) tax share.

In analyzing the tax effort of a country, if the tax effort index is greater than one, this means that the tax burden exceeds the taxable capacity. This suggests the taxpayer suffers more from tax deduction, which exceeds his/her ability to pay. Therefore, a high tax effort ratio, above one, indicates that the country is collecting more taxes than predicted taxable capacity and suggests a high tax burden (Mertens, 2003; Le et al., 2008).

Table 1: Typology of taxable capacity and tax burden

Taxable capacity	Tax burden	
	High	Low
High	High taxable capacity and high tax burden	High taxable capacity and low tax burden
Low	Low taxable capacity and high tax burden	Low taxable capacity and low tax burden

Source: Toye (1978)

On the other hand, if the tax effort index is <1, it suggests that the tax burden is less than the potential taxable capacity, and the country is collecting less in taxes than predicted hence, the country is not maximising its full revenue potential.

In Ghana, only a single work-in-progress report on estimating Ghana's tax capacity and effort by Brafu-Insaidoo and Obeng (2016) has been identified. Their work can be distinguished from this study in many ways. Methodologically, they propose to employ the stochastic frontier analysis technique, which estimates how much potential tax revenue is being lost and provides a policy-relevant measure of tax potential (capacity) and effort from 1985 to 2014. In this study, OLS regression and VAR models are employed on time series data from 1970 to 2015.

This study contributes to literature by computing taxable capacity, tax effort and tax burden with a view to assessing tax unfairness perceptions. From the foregoing discussions, we argue that since tax burden index gauges the entire tax burden borne by taxpayers, a high tax burden index would be perceived as tax unfairness whilst moderate and low indices would evoke tax fairness perceptions.

2.4. Factors Affecting Tax Capacity and Tax Effort

Extant literature (Zaki, 1992; Bird et al., 2008; Botlhole, 2010; Pessino and Fenochietto, 2013) has attempted to estimate tax effort and taxable capacity using different socio-economic factors.

Asserts that the factors that determine a country's taxable capacity include the stage of development, often measured by per capita income, the existence and extent of tax handles, and the efficacy of its tax administration.

Zaki (1992) posited that the ability of the national income to bear the tax burden changes according to changes in political, social and economic conditions. Therefore, any research into tax effort and potential taxable capacity in any economy should take into account several considerations.

Bird et al. (2008) and Botlhole (2010) showed that a country's tax effort may be influenced by its institutional factors such as corruption, voice and accountability.

Finally, Pessino and Fenochietto (2013) identified per capita GDP, the composition of the economy, the degree of openness of an economy, the ratio of public debt to GDP, the level of education of a country, and institutional factors such as corruption and governance.

3. METHODOLOGY: DATA SOURCES AND EMPIRICAL SPECIFICATION

The study employed OLS regression and VAR models for historical time series data from 1970 to 2015 in estimating the taxable capacity, tax burden and tax effort in Ghana. This follows Adanu and Sun, (2002) who used time series analysis to measure tax burden in each selected country separately. Data was sourced from BoG and WDI for dependent and explanatory variables respectively.

3.1. The Variables and Model Specification

Depending on the availability of data and its relevance to our discussion, this study employed the following variables; total tax revenue as a percentage of GDP, inflation, GDP deflator (annual %), population growth rate (annual %), GDP per capita growth (annual %), agriculture value added (% of GDP), external debt stocks (% of GNI) and services value added (as a % of GDP). The choice of the variables was triggered by prior studies and the availability of data. Based on these the econometric model is specified as follows:

$$TGDP = \beta_0+\beta_1 INFL_t+\beta_2 POPG_t+\beta_3 GDPG_t+\beta_4 AGRV_t+\beta_5 DEBT_t+\beta_6 SERV_t+\varepsilon_t \quad (1)$$

Where,

β_0 is the constant of the regression model,

TGDP is the ratio of tax revenue to GDP, measure of taxable capacity or tax potential,

INFL is the inflation, GDP deflator (annual %),

POPG is the population growth rate (annual %),

GDPG is the GDP per capita growth (annual %),

AGRV is the agriculture value added (% of GDP),

DEBT is the external debt stocks (% of GNI),

SERV is the services value added (% of GDP),

ε is the error term, $\varepsilon_t \sim (0, \sigma^2)$, and

t is time period ranging from 1970 to 2015.

GDP per capita growth rate. This variable is included in the regression as a proxy for the level of development of Ghana. A higher level of income typically triggers a greater demand for public goods and services, and increases the overall ability to pay and therefore a higher tax payment and collection are expected (Bahl, 1971). One would expect the sign of the coefficient on GDP per capita growth rate in the regression model to be positive (Piancastelli, 2001).

Population growth rate. To test the impact of demographic characteristics on Ghana's taxable income, the study used specifically population growth rate. From literature, the regression coefficient for this variable is expected to be positive.

Agricultural value added is measured as a fraction of GDP. Value added is the net output of the agricultural sector after adding up all outputs and subtracting intermediate inputs. The agricultural sector is mostly considered as a subsistence sector because of its relevance to a lower commercialisation and industrialisation level. That means a lower potential for taxable capacity (Bahl, 1971). Therefore, agricultural valued added is an important factor in determining the taxable capacity and tax effort. The expected regression coefficient sign is negative (Piancastell, 2001; Ghura, 1998; Eltony, 2002; Bird et al., 2008). In Ghana, most areas of the agricultural sector are exempt from taxation. Many studies find a negative relationship between agriculture share in GDP and tax revenue performance (Pessino and Fenochietto, 2010; Gupta, 2007).

Inflation many countries including Ghana do not adjust their tax systems for inflation or do so only partially. However, when

inflation reaches significant levels, its impact on the tax system cannot be discounted resulting in an increase in public expenditure. In estimating the tax burden, inflation becomes very essential because it affects the financial situation of the taxpayer through the elements of tax rate and tax base. Extant literature projects a negative coefficient sign (Ghura, 1998; Vylkova and Pozov, 2013).

The external debt stock. In acquiring resources to govern a nation or address budget deficits in many emerging economies, such governments ask for donor support, rely on borrowing (internal and external) or tax revenue. A heavy reliance on public debts by emerging economies will have a significant impact on tax revenues. Ghura (1998) used change in external debt to GDP ratio as an explanatory variable whiles Eltony (2002) selected outstanding foreign debt. The coefficients in both studies revealed a positive relationship with tax/GDP ratio (Eltony, 2002; Ghura, 1998; Pessino and Fenochietto, 2013).

Services value added. This iincludes wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, education, and health care. Piancastelli (2001) maintains that services value added as a percentage of GDP should have a positive relationship with taxable capacity. It is worth noting that the Ghanaian economy is moving from agrarian to services industry. The contribution of the agricultural sector to GDP in 2016 was 18.9% whereas that of the services sector was 56.8%. In 2017, the trend of the services sector exceeding agricultural sector's contribution to GDP was 55.9% and 18.5% respectively.

The study follows the examples of specific single case countries and provinces (see Alfirman, 2003; Yahyaee, 1991; Nikoo, 1996; Brafu-Insaidoo and Obeng, 2016) for the estimation of taxable capacity, tax burden and tax effort.

Firstly, the fitted regression model was used and the values of the predictor variables are substituted to get the estimated taxable capacity. Secondly, the ratio of the actual to the predicted tax ratios is computed as an index of tax effort. With tax burden, the study adopted the approach used by Baer and Galvao (2005) where the overall tax burden was estimated as the tax/GDP ratio. Finally, the study segments the empirical results into two significant periods in Ghana's tax administration era: Pre-tax reform period (1970–1984) and post-tax reform period (1985–015).

3.2. Estimation Techniques

Enders (1995) observed that most macroeconomic time series data are usually non-stationary and do not meet the standards for OLS estimation. Consequently, the possible existence of unit roots in the variables could lead to spurious estimates (Harvey, 1991). The appropriate way of dealing with such unit root problems is to determine if each variable has the same order of integration. Hence, we conducted stationarity tests using the Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) test statistics. According to Dickey and Fuller (1979), employing the unit root test helps to determine whether the variables are stationary in levels or at their first difference. We then proceed to determine their order of integration at which the series becomes stationary. The PP (Phillips and Perron, 1988) test is applied as an alternative to ADF unit root test because it computes a residual variance that is robust to auto-correlation.

Table 2 shows the results of the stationarity tests in levels and Table 3 displays first differences. The results indicated that INFL,

Table 2: Unit root test results at levels

Variable	Critical values**			Level	
	1%	5%	10%	ADF test statistic	PP test statistic
TGDP	−3.58474	−2.92814	−2.60223	−1.86186	−1.85244
INFL	−3.58474	−2.92814	−2.60223	−5.24286	−5.38594
POPG	−3.58474	−2.92814	−2.60223	−3.43441	−2.54399
GDPG	−3.58474	−2.92814	−2.60223	−4.43209	−4.44814
AGRV	−3.58474	−2.92814	−2.60223	2.43629	2.13662
DEBT	−3.58474	−2.92814	−2.60223	−1.49558	−1.77816
SERV	−3.58474	−2.92814	−2.60223	−0.61734	−0.72754

**Critical values are obtained from MacKinnon (1996). TGDP: Ratio of tax revenue to GDP, INFL: Inflation, POPG: Population growth rate, GDPG: GDP per capita growth, AGRV: Agriculture value added, DEBT: External debt stocks. SERV: Services value added

Table 3: Unit root test results at first difference

ADF and PP unit root test results						
Variable	Critical values**			First difference		Order of integration
	1%	5%	10%	ADF test statistic	PP test statistic	
ΔTGDP	−3.58474	−2.92814	−2.60223	−6.84075	−6.85369	I (1)
ΔINFL	−3.58474	−2.92814	−2.60223	–	–	I (0)
ΔPOPG	−3.58474	−2.92814	−2.60223	–	–	I (0)
ΔGDPG	−3.58474	−2.92814	−2.60223	–	–	I (0)
ΔAGRV	−3.58474	−2.92814	−2.60223	−4.98808	−5.64583	I (1)
ΔDEBT	−3.58474	−2.92814	−2.60223	−5.13928	−5.11882	I (1)
ΔSERV	−3.58474	−2.92814	−2.60223	−5.89871	−5.88927	I (1)

TGDP: Ratio of tax revenue to GDP, INFL: Inflation, POPG: population growth rate, GDPG: GDP per capita growth, AGRV: Agriculture value added, DEBT: External debt stocks. SERV: Services value added, ADF: Augmented Dickey-Fuller, PP: Phillips-Peron

POPG and GDPG became stationary at the levels while the rest of the variables became stationary after first differencing.

Since the variables are integrated of order I (0) and I (1), we proceed to test for the existence of a long-run relationship among the variables by employing ARDL bounds test for cointegration.

The ARDL has some desirable features over previous and traditional cointegration methods such as the Johansen cointegration. Firstly, it does not require all the variables under study to be integrated of the same order. Thus, it is applicable irrespective of whether the underlying series are I (0) or I (1) but not I (2). The second benefit is that the ARDL test is relatively more efficient in the case of small and finite sample data sizes (Narayan, 2004). Finally, in applying the ARDL technique, unbiased estimates of the long-run model are extracted (Harris and Sollis, 2003). Table 4 displays ARDL bounds tests for cointegration results.

In ARDL bounds testing, the joint F-statistic of asymptotic distribution, which is the null hypothesis of no long-run relationship, is rejected when the value of the test statistic exceeds the upper critical bound values. Table 4 shows that the F-statistic of 7.752 is greater than the upper bounds values at all significance levels. This suggests the existence of long-run relationship among the variables and paves way for ARDL regression model. Eviews automatic selection criterion (with a maximum of 4 lags) produced ARDL (4, 3, 4, 4, 2, 4, 3) as the selected model for further tests. The ARDL model was developed by Pesaran and Shin (1999) and Pesaran et al. (2001). The model is specified as:

$$\Delta(TGDP)_t = \alpha_0 + \sum_{i=1}^{p}\varphi_i\Delta(TGDP)_{t-i} + \sum_{i=0}^{p}\theta_i\Delta(INFL)_{t-i} + \sum_{i=0}^{p}\theta_i\Delta(POPG)_{t-i} + \sum_{i=0}^{p}\theta_i\Delta(GDPG)_{t-i} + \sum_{i=0}^{p}f_i\Delta(AGRV)_{t-i} + \sum_{i=0}^{p}f_i\Delta(DEBT)_{t-i} + \sum_{i=0}^{p}f_i\Delta(SERV)_{t-i} + \delta_1 TGDP_{t-1} + \delta_2 INFL_{t-1} + \delta_3 POPG_{t-1} + \delta_4 GDPG_{t-1} + \delta_5 AGRV_{t-1} + \delta_6 DEBT_{t-1} + \delta_7 SERV_{t-1} + \psi ECM_{t-1} + \mu_t \quad (2)$$

Where Δ is the difference operator, p is the optimal lag length, ψ representing the speed of adjustment while $ECMt-_1$ is the lagged error correction term measuring the speed of adjustment linking the short-run deviations to long-run equilibrium. The mathematical symbols, i $\alpha_{,,}$ and δ are the coefficients of the respective variables, μ is the stochastic error term and t represents the time period from 1975 to 2015.

Table 4: ARDL bounds tests for cointegration

ARDL bounds test				
Test statistic	Value	Significance (%)	Critical values	
			Lower bound	Upper bound
F-statistic	7.75206**			
		10	2.12	3.23
		5	2.45	3.61
		2.5	2.75	3.99
		1	3.15	4.43

**Critical values are obtained from Narayan (2004).

The cointegrating equation from the ARDL model is expected to be negative and significant to confirm a long-run relationship. A negative sign means that any shock, which occurs in the short-run, would be corrected in the long-run. However, the empirical results of ARDL (4, 3, 4, 4, 2, 4, 3) model posted a positive coefficient value of 0.417314 with a corresponding p-value of 0.3275, failing to confirm a long-run relationship.

Consequently, the study conducts a VAR model to analyse the short-run relationship and a VAR Granger causality test to determine whether TGDP can Granger-cause the independent variables altogether and the direction of the causality. Table 5 displays the VAR estimates.

Table 5 shows estimates of regression coefficients, their standard errors, t statistics values, and the overall p-value to test the significance of the model. The estimated regression model is:

$$TGDP = \underbrace{11.04}_{(18.059)} - \underbrace{0.04INFL_t}_{(0.029)} + \underbrace{5.14POPG_t}_{(16.707)} + \underbrace{0.50GDPG_t}_{(0.190)} - \underbrace{0.28AGRV_t}_{(0.274)} + \underbrace{0.05DEBT_t}_{(0.040)} + \underbrace{0.22SERV_t}_{(0.203)} \quad (3)$$

The model for the underlying equation (3) is well fitted and statistically significant. It satisfies other specification, diagnostic and multicollinearity tests. Its overall statistical properties are good as indicated by adjusted R^2 of 91.91%.

The study proceeded to perform a Granger causality test. Here, variable X is said to Granger cause variable Y, if lagged X can improve a forecast for lagged variable Y. The empirical results from the VAR Granger causality report that lagged TGDP Granger-causes the lagged independent variables all together (INFL, POPG, GDPG, AGRV, DEBT, and SERV). Therefore, we fail to accept the null hypothesis that lagged TGDP does not Granger-cause the lagged INFL, POPG, GDPG, AGRV, DEBT, and SERV all together.

On the other hand, apart from lagged GDPG which Granger-causes lagged TGDP, the other lagged variables such as INFL, POPG, AGRV, DEBT and SERV do not Granger-cause lagged TGDP. Therefore, we conclude that there is a uni-directional causality running from lagged TGDP to lagged INFL, POPG, AGRV, DEBT and SERV and a bi-directional causality between lagged TGDP and lagged GDPG.

Relying on Equation (3) to estimate the taxable capacity, Baer and Galvao's (2005) model for tax burden and Stotsky and Wolde Mariam (1997) tax effort method, the empirical findings are reported in Tables 6 and 7 for discussion.

Table 6 shows that from 1975 to 1977, Ghana recorded high tax efforts in tax revenue generation. However, the four years preceding the tax reform period (1981-1984) recorded low tax

Table 5: VAR model

Dependent Variable: TGDP				
Method: Least Squares (4, 3, 4, 4, 2, 4, 3)				
Variable	**Coefficient**	**Std. Error**	**t-statistic**	**Prob.**
INFL(-3)	−0.039867	0.028514	−1.398139	0.1956
POPG(-4)	5.136232	16.70760	0.307419	0.0765
GDPG(-4)	0.500577	0.189933	2.635537	0.0271
AGRV(-2)	−0.279628	0.273965	−1.020673	0.3341
DEBT(-4)	0.045063	0.040146	1.122474	0.2907
SERV(-3)	0.215213	0.202807	1.061170	0.3163
C	11.036346	18.05935	0.611111	0.0555
R-squared	0.980325	Mean dependent var		14.37158
Adjusted R-squared	0.919113	S.D. dependent var		5.070190
S.E. of regression	1.441994	Akaike info criterion		3.655885
Sum squared resid	18.71412	Schwarz criterion		4.905622
Log likelihood	−40.46181	Hannan-Quinn criter.		4.100532
F-statistic	16.01531	Durbin-Watson stat		2.485002
Prob (F-statistic)	0.000078			

Table 6: Pre-tax reform analysis: Taxable capacity, tax effort and tax burden

Analysis of taxable capacity, tax effort and tax burden			
Pre-tax reform period (1970-1984)			
Year	**Tax burden**	**Taxable capacity**	**Tax effort**
1970	19.63	18.05	1.09
1971	14.81	18.85	0.79
1972	12.4	15.15	0.82
1973	14.45	17.21	0.84
1974	15.64	16.39	0.95
1975	13.21	6.02	2.20
1976	14.62	7.31	2.00
1977	15.52	6.31	2.46
1978	5.21	7.85	0.66
1979	5.1	5.81	0.88
1980	5.44	10.71	0.51
1981	4.38	13.46	0.33
1982	4.02	14.22	0.28
1983	4.46	21.95	0.20
1984	6.63	23.70	0.26
Average	10.37	13.64	0.95

Source: Authors' computations

Table 7: Post-tax reform analysis: Taxable capacity, tax effort and tax burden

Analysis of taxable capacity, tax effort and tax burden			
Post-tax reform period (1985-2015)			
Year	**Tax burden**	**Taxable capacity**	**Tax effort**
1985	9.37	23.70	0.40
1986	12.15	22.08	0.55
1987	12.72	20.86	0.61
1988	12.29	21.14	0.58
1989	12.31	21.30	0.58
1990	10.81	22.64	0.48
1991	13.16	23.97	0.55
1992	10.77	24.07	0.45
1993	13.15	23.63	0.56
1994	16.16	22.99	0.70
1995	14.69	21.71	0.68
1996	15.09	20.82	0.72
1997	14.67	22.32	0.66
1998	15.78	22.52	0.70
1999	15.01	22.80	0.66
2000	16.26	24.50	0.66
2001	17.25	24.69	0.70
2002	18.23	25.49	0.72
2003	21.02	24.79	0.85
2004	21.81	24.25	0.90
2005	20.76	23.79	0.87
2006	20.25	25.37	0.80
2007	22.05	27.60	0.80
2008	15.90	28.92	0.55
2009	15.40	26.26	0.57
2010	16.70	29.26	0.57
2011	20.80	33.17	0.63
2012	17.10	31.33	0.55
2013	15.10	30.52	0.49
2014	16.70	29.86	0.56
2015	19.30	28.28	0.68
Average	15.90	25.01	0.64

Source: Authors' computations

efforts. This could be attributed to the harsh economic conditions from 1980 to 1983 coupled with the political instability of 1981.

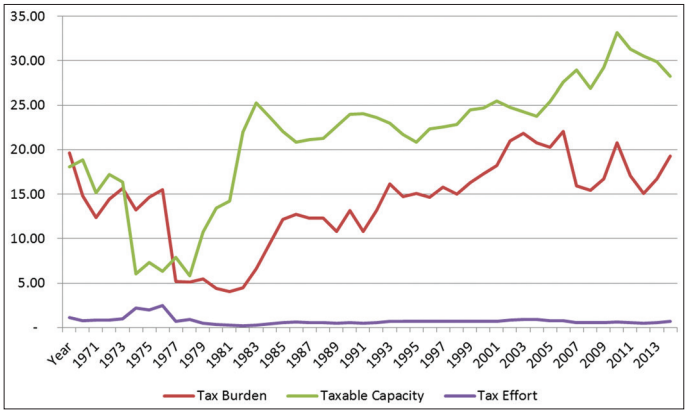
Figure 1 shows that taxable capacity moves in lockstep with tax burden. Apart from the main decline that occurred during the political instability period in Ghana, taxable capacity and tax burden have witnessed steady growth rates whiles the tax effort has been stable. The taxable capacity clearly lies above the tax burden, an indication that the tax burden is low resulting from the low tax efforts averaging 0.64.

4. DISCUSSION OF EMPIRICAL RESULTS

The order of integration of the variables are I (0) and I (1) after conducting unit roots tests using the ADF and PP test statistics. The ARDL bounds testing indicated a long-run relationship but the selected ARDL model (4, 3, 4, 4, 2, 4, 3) failed to confirm the long-run relationship necessitating the use of VAR model. Consequently, VAR Granger causality was conducted to test the short-run relationships running from TGDP to INFL, POPG, AGRV, GDPG, DEBT and SERV.

The study found an inverse relationship between the taxable capacity and agriculture value added as percentage of GDP and inflation rate in Ghana. The coefficients of the GDP growth rate,

Figure 1: Trend analysis of tax burden, taxable capacity and tax effort



population growth rate, service value added as percentage of GDP and external debt stocks are positive, suggesting positive relationships with the tax/GDP ratio.

These negative coefficients results are consistent with literature (Ghura, 1998; Piancastell, 2001; Eltony, 2002). In addition, the coefficient result of public debt stocks showing positive is consistent with prior literature (Ghura, 1998; Eltony, 2002). GDP per capita growth and services value added also positively impacts the taxable capacity and is consistent with prior literature (Piancastelli, 2001). On the other hand, a growing population of the working class could shore up tax revenues.

The 1985 tax reforms in Ghana were seen as a tool for accelerating growth, reducing poverty and reducing Ghana's dependence on foreign aid. It was based on four key areas: taxes on income and property, taxes on domestic goods and services, international trade taxes and value-added tax. To ensure the achievement of its objectives multiple and some nuisance taxes were introduced (Owusu-Afriyie, 2009; Kusi, 1998). However, from the empirical results, the post-tax reform period has not generated the much-needed tax revenue to achieve its objectives in spite of the multiplicity of taxes.

The empirical results show that Ghana has an average pre-tax reform and post-tax reform periods tax effort indices of 0.95 and 0.64 indices respectively. Using the tax effort as the criterion to test the first hypothesis, since the average tax effort indices for both the pre-tax and the post-tax dispensations are less than one (Mertens, 2003; Le et al., 2008), the study concludes that Ghana's taxable capacity has not been fully exploited, an indication that actual taxes collected were less than predicted taxes. Hence, the study accepts the null hypothesis.

The study results also show the tax burden in Ghana has been increasing steadily over the years soon after the tax reforms. In 1985, the overall tax burden in Ghana was 9.37 and 15.01 in 1999 compared with 22.05 in 2007 before declining to 15.90 in 2008 and 19.30 in 2015. If the tax effort index is greater than one, it means that the tax burden exceeds the taxable capacity and vice versa. Using empirical results of post-tax reform period tax burden averaging 15.90 and the taxable capacity of 25.01 to test the second hypothesis, since the taxable capacity is greater than the tax burden, we conclude that the tax burden is low. The study therefore fails to reject the null hypothesis, an implication that the tax burden is within the taxable capacity. This low tax burden index suggests a fair tax system, which should evoke tax fairness perceptions of taxpayers.

Ghana has an average post-tax reform period (1985–2015) tax effort of 0.64, which is similar to Brafu-Insaidoo and Obeng (2016) who estimated average tax reform tax effort as 0.48 (1985–2014) suggesting low tax efforts. The post-tax reform tax burden estimation of 15.90 is also similar to the 12.6 index they computed.

Pessino and Fenochietto (2010) posit that high levels of exemptions and low tax rates explain, in part, why some developing countries have a low level of tax effort. In Uganda, Ali et al. (2014) attributed the low tax efforts to low tax morale and Mawejje (2013) cited limited government investments in infrastructures that are critical to economic performance. Another reason for low tax efforts is the general public's perception that the rampant corruption and mismanagement of public resources have hindered the delivery of value for money on public investments (AfDB 2010b).

Again Bird et al. (2008) found that Latin American countries show consistently lower tax effort compared to other developing or transition countries. Performance in African countries shows a mixed performance. Some countries collect as little as half while others collect up to 2 to 3 times what they would be expected to.

5. CONCLUSION

This paper applied the OLS regression and a VAR model to compute taxable capacity, tax effort and tax burden in Ghana with a view to assessing tax administration efficiency and tax fairness perceptions. The study tested two hypotheses:

1. The taxable capacity (tax potential) in Ghana is more than the actual tax revenue, and
2. The overall tax burden in Ghana is high.

The test of the first hypothesis revealed that the revenue authority is collecting less tax revenue than it ought to, indicating untapped tax revenue potential. The second hypothesis revealed that tax burden is within the taxable capacity or the taxpayers' ability to pay because of low tax efforts, thus the overall tax burden in Ghana is not high.

We conclude that post-tax reforms have not generated the much-needed revenue because of low tax efforts and thereby confirming the tax administration inefficiency argument. On the other hand, the low tax burden index suggests a fair tax system. This is however at variance with taxpayers' perceptions of tax system unfairness in Ghana.

Finally, the results revealed that tax burden moves pari passu with the tax effort, which implies that when the tax collection effort exceeds unity, the tax burden exceeds the taxable capacity. The empirical results classify Ghana as a high taxable capacity and low tax burden country on Toye's typology matrix (see Table 1).

The implication is that, having knowledge of a country's taxable capacity and tax burden matrix will aid tax reform strategies

and address taxpayers' perceptions challenges. This will ensure that the right policies are implemented to achieve maximum tax revenues for sustainable development, which could support the Ghana Beyond Aid agenda.

The paper extends literature by computing taxable capacity, tax effort and tax burden of Ghana in assessing the tax fairness perceptions. Though extant literature has assessed their role in revenue generation and the efficiency of tax administration, their relationship with tax fairness perceptions has been ignored.

We recommend that embarking on tax reforms should not only be about appropriate and a multiplicity of tax laws and taxes, which could evoke tax unfairness perceptions but also the efficiency and integrity of tax administration. Further, the judicious use and prompt accountability of tax revenues could help address tax unfairness perceptions.

Finally, we recommend that to increase tax revenue concerted efforts must be geared towards increasing the tax efforts of revenue agencies through capacity building and the provision of adequate resources. Tax reforms should thus, start with reforms in the revenue authority' administration structure, processes and procedures.

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