



## **The Role of Corruption Control in Moderating the Relationship Between Value Added Tax and Income Inequality**

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### **ABSTRACT**

This paper investigates the mediating role of the control of corruption on value added tax (VAT) and income inequality in the top 10 most corrupted countries. We employed quantile regression to capture the varying effects of income inequality. The results suggest that most corrupted countries with lower income inequality did not benefit from VAT, but they stand to gain if the income inequality is wide. VAT seems to improve the effectiveness of tax collection, which the government can allocate the higher tax revenues for social and economic programs to benefit poor people. Our finding also suggest the extent of control of corruption and the improved governance of tax collection via VAT in our sample that consists of countries with high level of corruption are not strong enough to reduce income inequality.

**Keywords:** Income Inequality, Corruption, Value Added Tax

**JEL Classifications:** E62, H25, D73

### **1. INTRODUCTION**

Taxation is the main source of revenue for all governments around the world. In the US, taxes is estimated to contribute almost 95% (USD\$3,460 billion) of the total government revenue in 2017 (Budget for the US Government). Similar dependency on taxes is also found in other countries such as Malaysia where taxes are estimated to contribute 81.3% of total government revenue earned in 2016 (The Malaysian Economy in Figures, 2016). The Government mainly utilize their revenues for two main purposes (i) to finance public goods such as infrastructure, human capital, law and order and (ii) to correct a socially unacceptable distribution of market income (Atkinson, 1991). Thus, taxation plays an important role in reducing unequal distribution of income and wealth among people.

Previous studies (for instance Heady, 2001; Adam et al., 2015) conducted in developed countries found little evidence to prove the role of taxation in reducing income inequality. However, most

of the studies used direct tax (in particular income tax) as the proxy to measure the taxation effect on income inequality. Bird and Zolt (2005) argued since income taxes do not reduce income inequality in developed countries, we can expect the same effect in developing countries because their income tax systems are neither progressive nor comprehensive. The percentage of tax over gross domestic product (GDP) in developing countries is small, which then has little impact on narrowing income inequality. Indirect taxes, in particular, value added tax (VAT) is one of the solutions to reduce income inequality in developing countries (Bird and Zolt, 2005; Heady, 2001).

VAT provides a broad and more stable source of revenue than direct taxes (Durkan, 2010; Avi-Yonah, 2014). Prevailing economic conditions affect the government's collection of direct taxes (mainly consist of individual and corporate income tax). On the other hand, economic conditions do not affect VAT directly because it is based on consumption (Heady, 2001). This motivates countries around the globe, in particular developing countries

to impose VAT in order to reduce the uncertainty of revenue collection.

Studies have shown that corruption hinders the equal distribution of government revenues to the people (Gupta et al., 2002; Rose-Ackerman, 1997, 1999). Corruption also can distort the ability of government to collect taxes (Richupan, 1984; Alm et al., 1991; Bird, 1992) as observed in Sudan, Haiti and Venezuela, where corruptions and income inequality are perceived as high<sup>1</sup>, despite the fact that VAT has been implemented for over 15 years<sup>2</sup>. Hence, the impact of VAT on income inequality may be diluted in the developing countries due to widespread corruption. Engel et al. (1999) supported this argument, in which they found that the target of public spending was one of the most important factors to be considered to reduce income inequality.

However, Dobson and Ramlogan-Dobson (2012) argued that low corruption does not necessarily reduce inequality. Using Latin American countries, they argued that low corruption would increase inequality in countries when large informal sectors existed. They argued that in countries with large informal sectors people mainly derived their income from such markets. Thus, policies and regulations introduced to combat corruption affect the informal sectors and subsequently affect the source of income of the poorest people because they did not qualify to work in a formal market. Hence, income inequality becomes wider.

In this paper, we have two important objectives. First, we investigate the effect of VAT on income inequality in developing countries. Second, we examine whether corruption moderates the relationship between VAT and income inequality. The findings will improve our understanding on the influence of taxation system and corruption on income inequality in developing countries.

We proceed as follows. Section 2 reviews the related literature on control for corruption with income inequality and VAT which is then proceed with development of hypothesis. Section 3 deals with the methodological issue in our study. The results are further discussed in Section 4. Section 5 concludes.

## 2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

### 2.1. VAT and Income Inequality

VAT has been known for its regressive effect on people (Tait, 1991). VAT is levied upon consumption, thus it suppresses the lower income group as they have to pay a higher proportion of tax than the high income earners. Based on this argument, progressive taxes such as income tax are better than regressive tax to combat income inequality. A few prior empirical studies found support for this assertion (e.g. Leahy et al., 2011; Martinez-Vazquez et al.,

2012) where they observed that VAT widened income inequality. However, Duncan and Peter (2012) found that when government increased structural progressivity or tax rates of the income tax the high income earners had lower taxable income. This can be done either by working less, become less productive or simply reporting a smaller share of true income. People are likely to adopt the second option (i.e., tax avoidance or evasion); thus, the reducing effect of progressive tax on income inequality is questionable.

In contrast, Bye et al. (2012) showed that VAT reduced income inequality, particularly through government intervention by giving reduced rates or exemptions on basic necessities goods, thus reducing the regressive effect of VAT on consumers (Obadić et al., 2014). Shome (2009) argued that VAT is easy to administer and has lower likelihood of evasion than income tax; thus it is an efficient way of collecting government revenue (Keen and Smith, 2006). Engel et al. (1999) found that the progressivity of the tax system did not affect income inequality but the efficiency of taxes could reduce income inequality. In addition, they also noted that the government should also focus on determining the amount of revenue to be distributed and the target of public spending. Thus, we offer the following hypothesis:

H<sub>1</sub>: VAT increases income inequality

### 2.2. Corruption and Income Inequality

Although there is no universally accepted definition of corruption, it may be defined as the abuse of public power for personal gain and the three most common types of corruption include “bribery, extortion, and embezzlement” (Roy and Goll, 2014, p. 852). Meanwhile, inequality in a society may be caused by the differential wages, household composition, wealth, extent of government support and unemployment (Sloman, 2007). Taxation is one possible means of attaining greater income equality. In this section, we review prior literature on corruption and inequality.

Corruption which is typically seen as cancer in society, poses adverse effects on an economy. For instance, corruption distorts the wealth distribution in the economy such that some groups or people benefit more than others, the government programmes benefits groups other than the ones originally intended for and disturbs the government’s core functions of resource allocation, economic stabilisation and income redistribution (Gupta et al., 1998). Corruption also erodes transparency and causes uncertainty, both of which are unfavourable economic traits (Roy and Goll, 2014). It also diverts resources away from productive sectors (Mandal and Marjit, 2009), increases income inequality by reducing economic growth, reduces the progressivity of tax systems, social spending, human capital, unequal asset ownership distribution and access to education (Gupta et al., 1998).

Unfortunately, corruption seems more prevalent in lower income countries where it affects the middle class the most (Foellmi and Oechslin, 2007). In fact, the most corrupt countries tend to be the worst in terms of economic performance (Blackburn and Forgues-Puccio, 2009). Conversely, countries with good governance (Dobson and Ramlogan-Dobson, 2012) that emphasizes

1 Sudan was ranked at number 173 while Haiti and Venezuela were jointly ranked at number 161 out of 175 countries in the world based on Corruption Perception Index 2015. Haiti and Venezuela also ranked top 30 most income inequality countries based on Gini coefficient produced by the World Bank.  
2 Sudan introduced VAT in year 2000, while Haiti and Venezuela implemented VAT in 1982 and 1993 respectively.

performance-based cultures and gender equality (Roy and Goll, 2014) tend to have lower corruption.

But at the same time, the irony is that government policies aimed at redistribution and equality may result in higher government spending which in turn opens greater avenues for corruption (Alesina and Angeletos, 2005). Moreover, a study on Latin America suggests that anti-corruption efforts in economies with weak governance and substantial informal sectors may worsen inequality (Dobson and Ramlogan-Dobson, 2012). This is because in these economies, the disadvantaged people may be displaced due to the difficulty in securing suitable jobs in the formal sector; thus, they become even worse-off as a result of anti-corruption efforts. Hence, anti-corruption efforts in such countries have to go hand in hand with improvement in governance. This leads us to our second hypothesis as follows:

H<sub>2</sub>: Corruptions moderates the relationship between VAT and income inequality.

### 3. METHODOLOGY

#### 3.1. Empirical Model

We use the quantile regression to study the differential effect of VAT on income inequality. Our regression model is as follows:

$$\text{Inequality}_{it} = \alpha_0 + \alpha_1 \text{LnVAT}_{it} + \alpha_2 \text{GDP/Cap}_{it} + \alpha_3 \text{Inflation}_{it} + \alpha_4 \text{Investment}_{it} + \alpha_5 \text{Trade}_{it} + \alpha_6 \text{FinDev}_{it} + \alpha_7 \text{Literacy}_{it} + \alpha_8 \text{GovExp}_{it} + D_1 \text{Crisis} + e_{it} \quad (1)$$

Where,

Inequality<sub>it</sub> = Gini coefficient for country i<sup>th</sup> at time t,

LnVAT<sub>it</sub> = Value added tax to government revenue for country i<sup>th</sup> at time t,

GDP/Cap<sub>it</sub> = Real gross domestic product (base year=2010) per capita for country i<sup>th</sup> at time t,

Inflation<sub>it</sub> = Inflation rate for country i<sup>th</sup> at time t,

Investment<sub>it</sub> = Real gross capital formation (base year=2010) for country i<sup>th</sup> at time t,

Trade<sub>it</sub> = Trade openness (ratio of exports plus imports to gross domestic product [GDP]) for country i<sup>th</sup> at time t,

FinDev<sub>it</sub> = Private credit to GDP ratio for country i<sup>th</sup> at time t

Literacy<sub>it</sub> = literacy rate for country i<sup>th</sup> at time t

GovExp<sub>it</sub> = Government expenditure to GDP ratio for country i<sup>th</sup> at time t,

Crisis = Dummy for economic crisis (1=Crisis year; otherwise, 0),

Year = Year dummy to control for cross-sectional correlation,

e<sub>it</sub> = Error-terms.

Next, we introduce the variable on the effect of control of corruption in our first estimation model, which gives us the second estimation model as follows:

$$\text{Inequality}_{it} = \alpha_0 + \alpha_1 \text{Corruption}_{it} + \alpha_2 \text{GDP/Cap}_{it} + \alpha_3 \text{Inflation}_{it} + \alpha_4 \text{Investment}_{it} + \alpha_5 \text{Trade}_{it} + \alpha_6 \text{FinDev}_{it} + \alpha_7 \text{Literacy}_{it} + \alpha_8 \text{GovExp}_{it} + D_1 \text{Crisis} + e_{it} \quad (2)$$

Where corruption<sub>it</sub> is the control of corruption for country i at time t obtained from World Governance Indicators by the World Bank.

Finally, we estimate the moderating role of control for corruption on the anticipated negative effect of VAT using an interaction term as presented below.

$$\text{Inequality}_{it} = \alpha_0 + \alpha_1 \text{LnVAT}_{it} + \alpha_2 \text{Corruption}_{it} + \alpha_3 \text{LnVAT}_{it} * \text{Corruption}_{it} + \alpha_4 \text{GDP/Cap}_{it} + \alpha_5 \text{Inflation}_{it} + \alpha_6 \text{Investment}_{it} + \alpha_7 \text{Trade}_{it} + \alpha_8 \text{FinDev}_{it} + \alpha_9 \text{Literacy}_{it} + \alpha_{10} \text{GovExp}_{it} + D_1 \text{Crisis} + e_{it} \quad (3)$$

We use quantile regression in this study because we wish to capture the varying effects of income inequality at different levels, which is not possible if we use a normal regression model of any mean regression techniques (Bitler et al., 2000). In fact, Chamberlain (1994) suggests that the quantile regression is particularly useful in earnings distributions analysis. We use quantile regression with non-additive fixed effects as proposed by Powell (2016). This model is proven to have added advantages in small T. Besides, it also allows the parameters to vary based on unknown function of the fixed effects and observation of the specific disturbances by relating the identification assumptions required in the quantile regression and the fixed effect quantile regression.

Our sample consists of the top 10 most corrupted countries according to the definition by World Governance Indicator by World Bank from year 1991-2015. Due to limitation of data, the model is estimated based on unbalanced panel data for not losing the number of observations. The total number of observations in our sample is 175.

#### 3.2. Definition of Variables

We employ Gini coefficient obtained from various countries statistical reports as a proxy for income inequality (Inequality<sub>it</sub>). Gini coefficient measures the income gap with the ranks between 0 and 1 where higher value indicates higher income inequality. We study the impact of VAT on income inequality using the natural logarithm of the total amount of VAT collection (LnVAT<sub>it</sub>) for each country. VAT is known for its regressive effect (Tait, 1991) because it is levied upon consumption; thus it suppresses the lower income group as they have to pay a higher proportion of tax than the high income earners. We expect that VAT increases income inequality due to its regressive effect.

Next, we use the corruption index obtained from International Country Risk Guide developed by Political Risk Services group that measures the control of corruption. This index refers to the extent of public power in exercising their private gain, which includes petty and grand forms of corruption. Besides, it also captures the state by elites and private interests, which provides a comprehensive methodology in measuring the government corruption that may distort the distribution of tax revenues. We expect the control of corruption moderates the regressive effect of the VAT and subsequently reduces income inequality, which is consistent with the argument of Gupta et al. (1998) that a country can achieve better economic outcomes when corruption is under control.

We select the control variables in this study based on the endogenous growth model, which include GDP per capita, inflation, investment, trade openness, financial development,

literacy rate, and government spending. Real GDP per capita with the base year of 2010 represents the stage of economic development. This variable captures the differences in economic development in a cross-countries analysis. A higher real GDP per capita represents higher average disposable income per individual household that is expected to lower income inequality. We use the inflation rate to control for macroeconomic policy environment. According to Tanzi (1977), effective macroeconomic policy helps to stabilize the inflationary episode that reduces income inequality.

We include the effect of investment in the ratio of gross capital formation to GDP. A higher ratio reduces income inequality due to higher average productivity among individuals. The trade openness represents the degree of exposure of an economy to external economic shocks. Higher trade openness increases income inequality due to greater trade integration (Milanovic and Squire, 2007). The financial development variable captures the degree of market integration due to dynamic globalization and liberalization.

We further control for educational background and human development using literacy rate. According Knight and Sabot (1983), higher education level reduces income inequality as a result of “compression” effect. Furthermore, higher education level enhances labor skills that will result in higher average income, which in turn reduces income inequality (Saint-Paul and Verdier, 1993; Zhang, 1996). We also include government spending to GDP

as a control variable because an effective and efficient government spending contributes to higher human capital development, which creates employment opportunities and reduces income inequality (Shafique and Haq, 2006).

Finally, we control for economic crises using a dummy variable to capture the economic shocks, which is expected to hinder economic development and distort economic policy implementation. It is generally observed that economic crises increase the unemployment rate hence, ultimately increase income inequality.

We present the descriptive statistics of the variables employed in Table 1 with comparison with the World average obtained from World Development Indicators database. Besides the sample countries also have high inflation rate with an average of 12.52% as compared to the world average inflation rate of 4.33%. This is consistent with the results of Al-Marhubi (2000) where corruption increases the inflationary episodes because of the reduction in revenues and government spending, which contributes to larger fiscal deficits and higher inflation.

In addition, the result also shows that on average the investment in these countries are low as compared to the world average. Mauro (1995) suggests that corruption may reduce the investment rate and growth rate of the countries because of it induces higher cost of businesses which affect the return of the entrepreneurial.

**Table 1: Descriptive statistics**

Variable	Mean±SD	Minimum	Maximum
VAT (% of GDP)			
Sample	8.152±10.739	0.251	45.091
Corruption control			
Sample	1.834±0.740	0.500	4.000
Real GDP per capita (constant=2010)			
Sample	3,165.215±2,592.769	356.067	10,221.820
World	8,800.331±833.093	7,480.396	10,049.899
Inflation (%)			
Sample	12.524±13.505	-0.290	115.520
World	4.334±1.578	2.661	8.950
Investment (% of GDP)			
Sample	20.111±6.450	5.470	39.160
World	24.095±0.657	22.976	25.486
Trade openness			
Sample	65.053±23.029	30.044	119.858
World	54.153±5.725	44.240	61.087
Financial development (%)			
Sample	22.872±15.083	1.384	73.831
World	123.229±6.388	107.838	135.861
Literacy rate (%)			
Sample	81.543±15.123	51.100	99.800
World	83.607±2.413	81.900	85.313
Government expenditure (% of GDP)			
Sample	12.134±3.765	5.000	27.400
World	16.681±0.546	16.062	17.883
Population (million)			
Sample	38.900±39.700	4.871	177.000
World	6,519.101±457.576	5,788.596	7,260.780
Unemployment rate (%)			
Sample	16.602±15.122	2.700	51.330
World	6.027±0.585	5.067	7.108

SD: Standard deviation, GDP: Gross domestic product

### 4. RESULTS AND DISCUSSIONS

Lower investment is possible the reason for high unemployment rate of 16.60%.

We find that the VAT collection in the most corrupted countries is on average 8.15%, which is relatively low as compared to the tax collection. This result indicates that the VAT is not the major source of income in the world as suggested by (Keen and Mintz, 2004). This may due to the high level of corruption in these countries, which had adversely affected the effectiveness and efficiency of VAT collection (Richupan, 1984). We observe that the corruption index in the top ten most corrupted countries is on average about 1.83 as compared to the maximum index of 6 which indicated that the countries in our sample are at below average.

A closer look at the sample of most corrupted countries show that it consists of mostly developing economies with a real GDP per capital (constant at 2010) of about USD3,165.22 as compared to the world average of USD8,800.331. This result validates the finding of Svensson (2004), which suggests that corruption is a serious matter in the developing countries. This may due to high rent-seeking behaviour in the developing countries as compared to the developed countries. Hence, Bardhan (1997) suggested that progression of economic growth generates significant forces to reduce corruption.

We show the correlation matrix in Table 2. The analysis indicates that our variables are not highly correlated when we adopt a threshold of 60%. Hence, the estimation model does suffer from multicollinearity problems.

Table 3 presents the ordinary least squares estimation (OLS) and the quantile regression results based on interquartiles of 25%, 50%, 75% and 90%. The OLS is presented for comparison purpose.

First, we observe that the most corrupted countries in the world do not benefit from the VAT when they have lower income inequality as indicated in the results of Q25 and Q50. This result supports the assertion that the relationship between VAT and income inequality is vague because VAT could have differential impacts in countries with different inequality gap as argued by Emran and Stiglitz (2007).

Results in Table 1 also indicate that in countries with an extreme high income inequality, VAT reduces income inequality as shown in the results of Q75 and Q90. It seems that VAT improves the efficiency and effectiveness of tax compliance, which in turn benefits the countries with high income inequality. This result implies that when VAT collection improved the government has the ability to finance the growth with greater investment in the social welfare. Our finding is consistent with the study of Avi-Yonah (2014) who observes that VAT reduces income inequality when the government uses it to finance social programs. Further, Magu (2013) finds that VAT benefits countries with poor tax collection and huge inequality gap.

On the other hand, we observe that VAT increases income inequality in countries that have low income inequality. This result supports the assertion that the relationship between VAT and

**Table 2: Correlation matrix**

	Gini	LnVAT	Corruption control	VAT*corruption control	LnGDP Cap	Inflation	Investment
Gini	1.000						
LnVAT	-0.243***	1.000					
Corruption control	0.022	0.054	1.000				
VAT*corruption control	0.002	0.211***	0.986***	1.000			
LnGDP Cap	-0.204***	0.641***	0.055	0.156**	1.000		
Inflation	-0.167**	0.214***	0.031	0.062	0.493***	1.000	
Investment	-0.454***	0.378***	-0.035	0.013	0.365***	0.219***	1.000
Trade	-0.306***	0.192**	-0.227***	-0.181**	0.241***	0.028	-0.038
FinDev	-0.224***	0.418***	-0.210***	-0.137*	0.265***	-0.054	0.332***
Literacy	-0.608***	0.477***	-0.060	0.009	0.618***	0.273***	0.503***
Govex	-0.536***	0.095	0.012	0.018	-0.031	0.032	0.157**
LnPOP	-0.102	-0.075	-0.175**	-0.181**	-0.182**	0.159**	-0.079
Unemployment	0.029	-0.615***	-0.100	-0.206***	-0.599***	-0.114	-0.008
Crisis	-0.262***	0.219***	0.112	0.149**	0.282***	0.240***	0.089
	Trade	FinDev	Literacy	Govex	LnPOP	Unemployment	Crisis
Trade	1.000						
FinDev	0.385***	1.000					
Literacy	0.615***	0.368***	1.000				
Govex	0.302***	0.173**	0.418***	1.000			
LnPOP	-0.269***	0.026	-0.435***	0.184**	1.000		
Unemployment	-0.425***	-0.254***	-0.391***	0.201***	0.280***	1.000	
Crisis	0.159**	0.253***	0.168**	0.162**	0.150**	-0.113	1.000

Gini is the coefficient to measure inequality. LnVAT refers to natural logarithm of value added tax in USD; corruption control is the corruption index from PRS group; VAT\*corruption control is the interaction term to test for moderating effect. Control variables include: LnGDP is the natural logarithm of real GDP per capital (base=2010); inflation is the percentage of inflation rate; investment is the percentage of real gross capital formation to GDP ratio base year of 2010; trade is the ratio of trade openness; FinDev is the ratio of private credit to GDP; literacy is the literacy rate measures in percentage; GovExp is the percentage of government expenditure to GDP; LnPOP is the natural logarithm of population; unemployment is the percentage of unemployment rate; crisis if the dummy variable assigned for economic crisis (1=crisis year otherwise 0). \*\*\*/\*\*/\* denotes significant level at 1%/5%/10%, respectively

**Table 3: VAT and inequality**

Variable	OLS	Q (25)	Q (50)	Q (75)	Q (90)
LnVAT	0.108 (1.007)	1.559*** (0.002)	0.630*** (0.001)	-0.498*** (0.001)	-0.382*** (0.000)
LnGDP Cap	3.379** (1.077)	2.798*** (0.001)	4.287*** (0.001)	3.827*** (0.001)	3.070*** (0.000)
Inflation	6.240 (5.547)	-2.068*** (0.009)	-2.560*** (0.005)	5.417*** (0.007)	1.385*** (0.000)
Investment	-14.449 (12.433)	-28.484*** (0.046)	-7.860*** (0.011)	-19.848*** (0.040)	-20.779*** (0.001)
Trade	6.049 (4.247)	4.308*** (0.011)	6.135*** (0.006)	2.160*** (0.010)	0.287*** (0.003)
FinDev	7.904 (5.307)	0.092*** (0.011)	6.268*** (0.008)	14.747*** (0.007)	13.950*** (0.001)
Literacy	-64.836*** (10.297)	-52.382*** (0.022)	-67.881*** (0.018)	-56.147*** (0.007)	-44.914*** (0.002)
Govex	4.363 (37.346)	-20.133*** (0.051)	-5.566*** (0.037)	-10.247*** (0.029)	-24.139*** (0.008)
LnPOP	-4.926*** (1.111)	-3.078*** (0.001)	-5.044*** (0.001)	-5.645*** (0.003)	-4.980*** (0.001)
Unemployment	4.078 (8.038)	10.506*** (0.023)	9.660*** (0.011)	6.062*** (0.012)	14.730*** (0.002)
Crisis	-5.225* (2.744)	-1.025*** (0.004)	-2.605*** (0.002)	-0.955*** (0.002)	-0.799*** (0.001)
Constant	149.539*** (34.782)				
R <sup>2</sup>	0.672				
Number of observations	175				

The estimation involves Ordinary Least Squares (OLS) and Panel Quantile Regression for Fixed Effects with Adaptive MCMC optimization proposed by Powell (2016) for interquartile (25%, 50%, 75% and 90%) Dependent variable: Gini coefficient to measure inequality. LnVAT refers to natural logarithm of value added tax in USD. Control variables include: lngpd is the natural logarithm of real GDP per capital (base=2010); inflation is the percentage of inflation rate; investment is the percentage of real gross capital formation to GDP ratio base year of 2010; trade is the ratio of trade openness; FinDev is the ratio of private credit to GDP; literacy is the literacy rate measures in percentage; GovExp is the percentage of government expenditure to GDP; LnPOP is the natural logarithm of population; unemployment is the percentage of unemployment rate; crisis if the dummy variable assigned for economic crisis (1=crisis year otherwise 0). \*\*\*/\*\*/\* denotes significant level at 1%/5%/10%, respectively

income inequality is vague because VAT could have differential impacts in countries with different inequality gap as argued by Emran and Stiglitz (2007).

Next, we estimate the effect of corruption on income inequality. We show the results in Table 4.

Our result suggests that the control of corruption reduces income inequality in all the quantiles at 1% significant level. Our results are consistent with Gupta et al. (1998) in which the result implies that a good control of corruption reduces income inequality through better allocation of resources and economic stabilization. This result is similar to Tanzi and Dvoodi (1997) where they find corruption resulted in significant leakages in tax revenues; thus limiting the ability of government to allocate funds for the betterment of the economic welfare of the people (Ajaz and Ahmad, 2010).

Finally, Table 5 shows the result of the moderating effect of control of corruption in the link between VAT and income inequality.

We observe that in the sample of most corrupted countries, the interaction term of VAT and corruption increases income inequality all quantiles save for the highest quantile where the result is not statistically significant. This result may be driven by a relatively poorer corruption control in the sample countries as evidenced

by the average index of 1.83 (Table 1). Hence, we anticipate an improvement in the control of corruption in those countries in terms of a higher corruption index could produce a positive result.

Gupta et al. (1998) suggests that corruption increases income inequality and poverty due to the poor targeting of social programs. Countries with higher corruption level tend to experience intense lobbying for favourable policies for the wealthy, which further widens income inequality. Further, lower social spending, unequal access to education and higher risk of investment decisions of the poor may further contribute to the increase in income inequality of the most corrupted countries where the control of corruption is still relatively low; hence, we do not observe the moderation effect in this study as expected.

## 5. CONCLUSION

This study has two objectives. First, we investigate the effect of VAT on income equality in developing countries. Second, we examine the moderating effect of control of corruption in the link between VAT and income inequality. We hypothesise that VAT increases income inequality in developing countries because it is levied based on consumption, which the poor people pay a higher proportion of taxes and in turn reduces their disposable income. Then, we suggest that a better control of corruption moderates the effect of VAT on income inequality. Sound control

**Table 4: Corruption control and inequality**

Variable	OLS	Q (25)	Q (50)	Q (75)	Q (90)
Corruption control	-1.178** (0.592)	0.020 (0.060)	-1.650*** (0.001)	-1.904*** (0.002)	-0.273*** (0.001)
Lngdpcap	3.431*** (1.154)	3.246*** (0.074)	3.892*** (0.001)	3.633*** (0.001)	2.773*** (0.001)
Inflation	6.789 (5.402)	-0.551 (1.249)	2.711*** (0.003)	3.347*** (0.010)	0.715*** (0.006)
Investment	-13.519 (12.261)	-16.049*** (2.191)	-5.356*** (0.006)	1.448*** (0.016)	-11.935*** (0.028)
Trade	4.432 (3.982)	1.752*** (0.513)	3.688*** (0.002)	1.460*** (0.008)	2.199*** (0.006)
FinDev	7.301 (5.074)	4.873*** (0.669)	4.274*** (0.002)	10.652*** (0.005)	12.278*** (0.004)
Literacy	-66.949*** (9.796)	-50.632*** (1.783)	-66.623*** (0.005)	-62.063*** (0.012)	-43.522*** (0.016)
Govex	15.023 (35.097)	-10.251** (4.626)	8.592*** (0.018)	-14.348*** (0.068)	-35.275*** (0.041)
LnPOP	-5.370*** (1.324)	-3.365*** (0.105)	-6.007*** (0.001)	-6.204*** (0.003)	-5.080*** (0.001)
Unemployment	1.403 (6.944)	4.448*** (0.844)	2.918*** (0.002)	2.297*** (0.004)	17.203*** (0.010)
Crisis	-4.611 (2.955)	-1.802*** (0.259)	-0.947*** (0.001)	-0.565*** (0.002)	-1.114*** (0.001)
Constant	162.922*** (27.100)				
R <sup>2</sup>	0.680				
Number of observations	175				

The estimation involves ordinary least squares (OLS) and panel quantile regression for fixed effects with adaptive MCMC optimization proposed by Powell (2016) for interquantile (25%, 50%, 75% and 90%) Dependent variable: Gini coefficient to measure inequality. Corruption control is the corruption index from PRS group. Control variables include: lngdpcap is the natural logarithm of real GDP per capita (base=2010); inflation is the percentage of inflation rate; investment is the percentage of real gross capital formation to GDP ratio base year of 2010; trade is the ratio of trade openness; FinDev is the ratio of private credit to GDP; literacy is the literacy rate measures in percentage; GovExp is the percentage of government expenditure to GDP; LnPOP is the natural logarithm of population; unemployment is the percentage of unemployment rate; crisis if the dummy variable assigned for economic crisis (1=crisis year otherwise 0)

**Table 5: Moderating effect of corruption control on VAT and inequality**

Variable	OLS	Q (25)	Q (50)	Q (75)	Q (90)
LnVAT	-3.299* (1.593)	-1.962*** (0.044)	-1.672*** (0.105)	-2.704*** (0.068)	-661.937 (1701.173)
Corruption control	-44.308** (13.651)	-49.568*** (0.519)	-26.710*** (2.277)	-29.676*** (0.965)	-14,706.050 (37,862.220)
VAT*corruption control	2.004** (0.646)	2.256*** (0.023)	1.189*** (0.093)	1.288*** (0.046)	671.392 (1,728.974)
LnGDP Cap	3.056*** (0.936)	3.700*** (0.046)	3.115*** (0.132)	3.427*** (0.138)	-136.267 (354.638)
Inflation	6.733 (5.069)	-0.814*** (0.281)	1.171** (0.482)	2.058*** (0.445)	1743.796 (4,500.907)
Investment	-13.762 (12.694)	-29.594*** (0.517)	-4.325* (2.263)	-1.024 (1.489)	2850.430 (7,347.043)
Trade	0.983 (4.403)	3.538*** (0.095)	3.896*** (0.805)	2.150*** (0.777)	-968.381 (2,476.009)
FinDev	6.987 (5.062)	-0.299** (0.132)	1.762*** (0.248)	6.403*** (0.395)	-6473.712 (16,715.400)
Literacy	-59.808*** (8.334)	-56.000*** (0.494)	-61.557*** (0.661)	-56.879*** (1.110)	-7140.200 (18,360.130)
Govex	15.678 (31.059)	-0.025 (0.804)	7.315*** (0.766)	-16.703*** (1.627)	28310.190 (73,221.230)
LnPOP	-5.302*** (1.233)	-4.671*** (0.025)	-6.281*** (0.049)	-5.191*** (0.103)	-1,254.794 (3,226.565)
Unemployment	3.161 (7.627)	17.486*** (0.132)	2.964*** (0.686)	-1.816* (0.953)	-2252.589 (5,847.608)

(Contd...)

**Table 5: (Continued)**

Variable	OLS	Q (25)	Q (50)	Q (75)	Q (90)
Crisis	-5.030 (2.892)	-2.564*** (0.070)	-0.398** (0.194)	-0.727* (0.392)	1136.159 (2,911.422)
Constant	231.878*** (41.553)				
R <sup>2</sup>	0.714				
Number of observations	175				

The estimation involves ordinary least squares (OLS) and panel quantile regression for fixed effects with adaptive MCMC optimization proposed by Powell (2016) for interquartile (25%, 50%, 75% and 90%) dependent variable: Gini coefficient to measure inequality. LnVAT refers to natural logarithm of value added tax in USD; corruption control is the corruption index from PRS group; VAT\*corruption control is the interaction term to test for moderating effect. Control variables include: LnGDP is the natural logarithm of real GDP per capital (base=2010); inflation is the percentage of inflation rate; investment is the percentage of real gross capital formation to GDP ratio base year of 2010; trade is the ratio of trade openness; FinDev is the ratio of private credit to GDP; literacy is the literacy rate measures in percentage; GovExp is the percentage of government expenditure to GDP; LnPOP is the natural logarithm of population; unemployment is the percentage of unemployment rate; crisis is the dummy variable assigned for economic crisis (1=crisis year otherwise 0). \*\*\*/\*\*/\*denotes significant level at 1%/5%/10%, respectively

of corruption minimizes the opportunities for corrupt practices in the government sector that divert tax revenues from the productive sectors that can reduce the income gap.

Our result of quantile regression shows that most corrupted countries did not benefit from VAT if they also have lower income inequality but they stand to gain if the income inequality is wide. VAT seems to improve the effectiveness of tax collection, which the government can use the higher tax revenues for social and economic programmes for the poor people. This result also indicates that the link between VAT and income inequality is ambiguous in which the income inequality increases in countries that have lower income inequality. However, this findings show that there is a differential effect of VAT depending on the level of income inequality in each country.

We also observe that control of corruption reduces income inequality for which it helps to realign the allocation of funds to productive sectors and plucked in possible leakages in tax revenue collections. As for the moderating effect analysis we find that the interaction term of the control of corruption and VAT increases income inequality, which is contrary to our expectation. This finding suggest the extent of control of corruption and the improved governance of tax collection via VAT in our sample that consists of countries with high level of corruption are not strong enough to reduce income inequality. In fact, this combination makes the effect of VAT in countries with higher income inequality (as observed in the direct effect analysis) weaker.

Notwithstanding the ineffective combination of VAT and control of corruption in narrowing income inequality our study shows that there is a differential effect of VAT on income inequality; thus confirming the finding of Emran and Stiglitz (2007) and control of corruption alone is a powerful tool to reduce income inequality in countries with high income inequality. We suggest future studies to make a comparative analysis between those highly corrupted countries and low corruption countries to identify the differential effect of the combination between VAT and control of corruption on income inequality.

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