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Dynamic Analysis of Trade Misinvoicing and VAT in Developing Countries: Dynamic Panel Data Model

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Abstract:

The study aims to analyze the effect of trade misinvoicing on VAT and the role of regulatory quality in reducing the effect of trade misinvoicing on VAT. The study uses a panel data structure with a sample of 53 developing countries from 2002 to 2019. It is estimated using static and dynamic panel approaches using the GMM model. The estimation results show that trade misinvoicing significantly reduces VAT, but regulatory quality does not reduce the effect of trade misinvoicing on VAT. The study also shows that regulatory quality affects increasing VAT, and the previous period's VAT revenue also has a positive and significant effect on VAT revenue for the current period. By region group, trade misinvoicing experienced by countries in Europe & Central Asia and Middle-East & North Africa affected the decline in VAT.

Keywords: *VAT, Trade Misinvoicing, Institutional Quality, Dynamic Panel Model*

1. Introduction

Value Added Tax (VAT) is one of the very important tax revenues for the state. VAT is a development of general consumption taxes whose revenue growth was swift from 1965 to 2019, especially in OECD countries (OECD, 2021). Data shows that the contribution of VAT to total tax revenues in OECD countries in 2019 reached 20.3% of total tax revenues, Asian and Pacific countries reached 23%, and the highest in African countries reached 30%. The data shows the magnitude of the contribution of VAT to state revenues. VAT has become a "money machine" for the government and its increase in revenue as an indication of the development of tax instruments and administration (Keen & Lockwood, 2010). However, recent evidence suggests that the effectiveness of VAT in generating income is not as expected, mainly due to informality and information issues in developing countries (Mudiyanselage & Chen, 2022). This can be seen from Figure 1 which shows that during the period from 2010 to 2019 almost all groups of countries did not appear to have a significant increase in VAT. This shows that there are obstacles to collecting VAT in each country.

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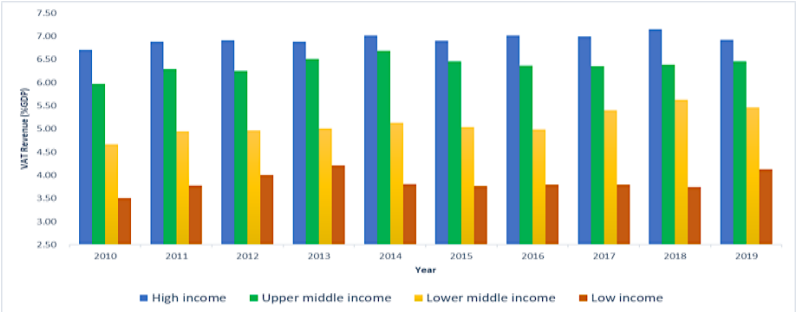

Figure 1. Trends in Average VAT Revenue Based on Income Group 2010-2019

Source: IMF (2022) and World Bank (2022), processed

Every country has constraints in optimizing tax revenues, including developing countries. Taxation specialists have grouped into 4 (four) categories of causes of tax systems in developing countries not being able to generate higher tax revenues, namely (1) internal political factors, (2) administrative constraints, (3) external political factors, and (4) economic structure (Mills, 2017). One of the external forms of politics referred to is the avoidance of the imposition of VAT on international trade. The imposition of taxes on import activities is a motive for tax avoidance. Each importer must pay customs duties and VAT on goods imported when entering a country's border (destination border). The form of VAT evasion that occurs in international trade activities, especially imports, occurs through discrepancies in reporting the value of imports in the destination country with the export value when goods are shipped from the country of origin or what is known as the difference in trade value (trade misinvoicing). Misinvoicing practices, including falsification of values, volumes, and/or classifications of goods or services deliberately carried out by at least one party, are identified as the main channels of illicit financial outflows in developing countries (Asmah et al., 2020). Based on GFI (2020), it is estimated that trade misinvoicing in import and export activities involving 135 developing countries with 36 developed countries in the 2008-2017 period with a value of US $ 8.7 trillion and specifically in import activities it is known that there is an increase in trade misinvoicing trends in developing countries during the 2000-2019 period as shown in figure 2. Developing countries tend to become victims of trade misinvoicing due to several conditions including (1) weak currency, (2) unstable security and political factors, (3) highly dependent on the import of manufactured goods, and (4) weak capabilities and resources of customs institutions (GFI, 2020). These data and information are also supported by the results of empirical studies conducted by Hong & Pak, (2017); Javorsek, (2016); Kravchenko, (2018); Patnaik et al., (2012) show that the practice of misinvoicing and capital flight is still occurring and developing in developing countries. This shows that trade misinvoicing is a continuous problem in developing countries and has great potential to erode tax revenues.

Empirical studies on the relationship of trade misinvoicing to VAT have so far been minimal. Sarmento (2016) shows that imports negatively affect VAT in a sample of countries in the European region. However, a more detailed explanation of why imports negatively affect VAT is unknown. Furthermore, Asmah et al., (2020) use trade misinvoicing variables to cause the decline in tax revenues in sub-Saharan

Africa. The use of tax revenue variables is considered inappropriate, considering that these variables contain all components of tax types, namely direct and indirect tax. It is unknown how all tax components can be affected by trade misinvoicing. Finally, Braml & Felbermayr, (2022) calculated with forensic accounting methods regarding the potential for a decrease in VAT in international trade activities due to differences in trade value (trade discrepancies) that occurred in several European countries in the 2006-2018 period. These results are also considered unable to describe the effect of trade misinvoicing on VAT due to the selection of specific samples in certain regions and the estimation method used.

The study of tax revenues so far has focused a lot on identifying the main determinants of tax policy. On the other hand, taxation is also a reciprocal relationship between government and society, so tax revenues and their composition are caused not only by economic factors but also by social and political factors (Castañeda Rodríguez, 2018). For developing countries, the option to increase tax revenue through tax policies such as increased rates and tax bases is likely to be avoided because it is politically unattractive and has the potential to increase non-compliance further. One of the right ways for developing countries to increase revenue is to strengthen institutions (Ricciuti et al., 2019). Torgler, (2003) showed that institutional regulations influence taxpayer behavior. For this reason, the political will to increase taxes is necessary, considering that the government is more aware of the potential loopholes in tax revenue. The form of the government's political will to increase tax revenue through improving institutional quality. The results of previous empirical studies show that institutional quality is essential for the government to develop reasonable regulations in building an optimal tax system (Castañeda Rodríguez, 2018; Epaphra & Massawe, 2017; Lien, 2015).

Based on the previous, this study will analyze (1) the effect of trade misinvoicing on VAT and (2) how much the role of the government through regulatory quality in suppressing the influence of trade misinvoicing on VAT. Unlike the previous study discussing VAT, this study is the first one describing the relationship between trade misinvoicing and VAT. In addition, the study on the determinants of VAT discusses more economic policies, such as rates and tax bases. In contrast, this study will analyze the role of the government through regulatory quality, which so far has not been discussed much in the study of VAT. Finally, the study of tax revenue as a whole (tax revenue) is known that there is a relationship between tax revenue in the previous period (t-1) with the current period (t) (Asmah et al., 2020; Castro & Camarillo, 2014; Minh Ha et al., 2022), so this study will use a dynamic data panel approach to address those endogeneity issues that to the extent the authors' knowledge is still minimally discussed in previous studies, particularly studies on VAT.

2. Methodology

The data structure used in the study is panel data, and static and dynamic panel methods carry influence estimation testing out. The static panel approach is made with the Ordinary Least Square (OLS) and Fixed-Effect Model (FEM), while the dynamic

panel is done with the GMM model. The dynamic panel proximity assumes the effect of VAT in period *t-1* on VAT in period *t* where the static panel model cannot accommodate the endogeneity problem so it will produce biased estimates. Arellano & Bond, (1991) developed a GMM estimator to overcome this with the first difference, thus eliminating fixed effect components. The estimation results in the GMM method are highly dependent on whether the instrument variable is valid. Therefore, a specification test was carried out as a Sargan test and a serial correlation test (Arellano-Bond test).

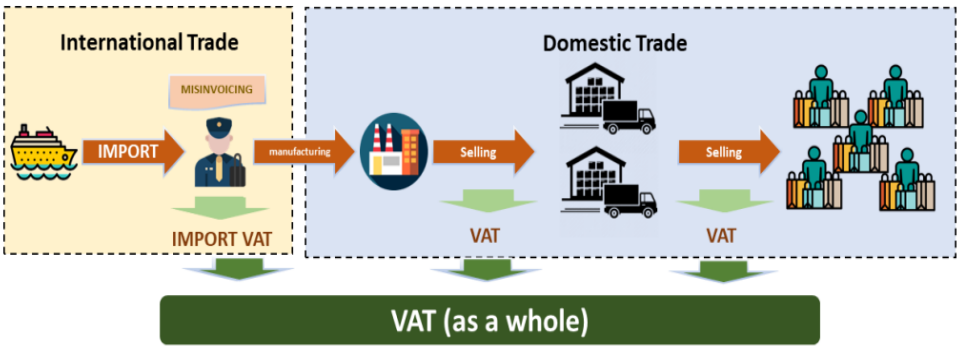

Figure 2. Illustration of the Relationship between Trade Misinvoicing and VAT
Source: Author Illustration

The empirical model of the study adapts the study of (Asmah et al., 2020) but uses a different dependent variable, namely VAT. The consideration is that the imposition of VAT is one of the reasons importers avoid taxes in international trade activities through trade misinvoicing activities (GFI, 2020) and has proven to cause a decrease in VAT (Braml & Felbermayr, 2022). The study's dependent variable is the VAT of the importing country i in the period t (VAT_{it}). The variable's value is the ratio of VAT revenue to GDP from developing countries. The study's independent variable is trade misinvoicing, which is the difference in trade value in the importing country i in the period t ($MisInv_{it}$). The study also used several control variables proven in previous studies to influence VAT and trade misinvoicing. Model 1 in equation (1) below is an OLS model performed assuming the influence of the specific characteristics of the sample captured by the intercept value (β_0), and the MisInv value (β_1) is the same for all observations.

$$VAT_{it} = \beta_0 + \beta_1 MisInv_{it} + \sum_{k=1}^{K} \delta_k Control_{it} + \varepsilon_{it}$$
$$where\ \ Control_{it}\ is\ control\ variable.$$

The OLS model has simple assumptions to produce an estimated value that tends to be biased, precisely *upward bias*. Therefore, Model 2 in equation (2) is an estimation test using FEM by including *time-effect* (λ_t) to capture the influence of other factors captured by *dummy* years during the observation period. Testing with FEM can reduce the bias of the OLS model results by issuing the value of the influence of unobserved variables (both time-invariant and *time-variant)* with the *VAT* and the value of the influence of the *unobserved* variable with *the MisInv.*

$$VAT_{it} = \beta_0 + \beta_1 MisInv_{it} + \sum_{k=1}^{K} \delta_k Control_{it} + \alpha_i + \lambda_t + \varepsilon_{it}$$

Furthermore, the value of the FEM model results is still considered biased because it is assumed that there is an influence $VAT_{i,t-1}$ with $VAT_{i,t}$. For this reason, the next estimation test is carried out with a dynamic panel approach, namely the GMM model, which is fully displayed in Model 3 in equation (3).

$$(VAT_{it} - VAT_{i,t-1}) = \gamma(VAT_{i,t-1} - VAT_{i,t-2}) + \beta_1\ (MisInv_{it} - MisInv_{i,t-1}) + \sum_{k=1}^{K} \delta_k\ (Control_{it} - Control_{i,t-1}) + \lambda_t + (\varepsilon_{it} - \varepsilon_{i,t-1})$$

for $t = 2, \dots, T$

Finally, Model 4 in equation (4) is an empirical model used to prove the effectiveness of policy quality in reducing the influence of *trade misinvoicing* on VAT. This model includes intermediate interaction variables such as the study of Asmah et al. (2020).

$$\Delta\, VAT_{it} = \gamma\, \Delta VAT_{i,t-1} + \beta_1\, \Delta MisInv_{it} + \sum_{k=1}^{K} \delta_k\, \Delta Control_{it} + \theta\ \Delta(MisInv_{it} * Reg_{quality}{}_{it}) + \lambda_t + \Delta\varepsilon_{it})$$

The author identifies endogeneity problems, including measuring variable VAT and *trade misinvoicing*. A country's VAT depend on several factors, including how large the tax base is and the extent of business compliance with the imposition of VAT. The VAT base comes from domestic imports, trade, or consumption (Jenkins & Kuo, 2000). Therefore, a country's VAT are influenced by import activities and domestic trade VAT policies, including VAT rates, exemptions, and *threshold* values for the imposition of VAT. The study included a *time-variant* VAT policy as a control variable, namely the standard VAT rate (*VATrate*), to overcome this endogeneity problem. In addition, other control variables are the variables of the percentage of the value-added value of the agricultural sector (*Agriculture*), inflation rate (*Inflation*), level of trade openness (*Openness*), and quality of state policy (*Reg_quality*). The problem of endogeneity also occurs if it is assumed that there is a relationship between the dependent variable (VAT_{it}) with the *lag* of the dependent variable ($VAT_{i,t-1}$). This problem occurs because of the correlation between the *lag* of the dependent variable ($VAT_{i,t-1}$) and the *error term* (ε_{it}) or referred to as Nickle *Bias* (Nickle, 1981). To overcome this problem, testing will be carried out with a dynamic panel approach with the GMM model. An essential point in the model is the determination of instrument variables that meet the properties of *exogeneity* and *relevance to* $VAT_{i,t-1}$. This study will directly determine the second *lag* of VAT ($VAT_{i,t-2}$) as an instrument variable over the variable $\Delta y_{i,t-1}$ as (Arellano & Bond, 1991). $VAT_{i,t-2}$ is the right instrument for $\Delta y_{i,t-1}$ because it has been shown to be uncorrelated.

MisInv is the aggregate value of the absolute difference in value in all commodities and trading partners of the importing country. In previous empirical studies, it was found that import duties, VAT rates, non-tariff barriers, FTAs, and levels of supervision affect the trade misinvoicing of a country (Beja, 2008; Buehn & Eichler, 2011; Ekananda, 2018; Fisman & Wei, 2004; Hong & Pak, 2017; Patnaik et al., 2012; Stoyanov, 2012; Yousefi et al., 2020; Yubiwini & Patunru, 2018). In addition, in the previous study, it was also assumed that the exporting country does not charge export VAT according to the destination principle, so it is assumed that there is no reason for exporters to manipulate the value of goods. Therefore, trade misinvoicing is behavior

by importers influenced by other factors. To overcome this problem, the control variables included in the test are expected to be able to overcome the problem of the endogeneity of the *MisInv*.

The study used a sample from all developing countries that have implemented VAT and conducted international trade, especially import trade, from 2002 – 2019 (list of countries in appendix 1). VAT data was obtained from the International Monetary Fund (IMF), and trade misinvoicing data was obtained from international trade data published by the World Integrated Trade Solution (WITS) database. The characteristics of developing countries use the basis of country classification by the World Bank based on the value of Gross National Income (GNI). The trade misinvoicing value in this study is the difference in trade value between the value of exports reported in the country of origin (c) and the value of imports reported by the destination country (i) in the period t (Demir & Javorcik, 2020; Fisman & Wei, 2004; Yousefi et al., 2020). Researchers also consider the value of insurance and freight contained in the import value (CIF), assuming a value of 10% (Ekananda, 2018; Patnaik et al., 2012). The adjustment was made to reduce measurement error over the import value in the study. For this reason, the calculation of the trade value of misinvoicing in this study is in equation (5)

$$Trade\ Misinvoicing_{c,i,t} = Ln\left(export_{c,t}\right) - Ln\left(\frac{import_{i,t}}{1{,}1}\right)$$

A brief explanation of the operational definitions, units, and data sources for each variable used in this study is presented in Table 1.

Table 1. Summary of Variables, Description, Units and Data Sources

No	Variable	Description	Unit	Data Sources
1	*VAT*	The ratio of VAT revenue to GDP	%GDP	IMF (2020)
2	*MisInv*	The difference between the reported export value in the country of origin and the value of the import reported by the destination country	Ln (US$)	World Integrated Trade Solution (WITS)
3	*L.VAT*	Total VAT revenue to GDP in the period t-1	%GDP	IMF (2020)
4	*Reg_ quality*	Perceptions of the government's ability to formulate and implement sound policies and regulations that permit and encourage private sector development	Index -2.5 (low) to 2.5 (high)	World Governance Indicators (WGI)
5	*VATrate*	Standard rate of VAT charged in each country	%	Arrachman & Qibthiyyah (2018), IMF (2020)
6	*Inflation*	The prevailing rate of price increase in the economy	%	World Development Indicator (WDI)

No	Variable	Description	Unit	Data Sources
7	*Openness*	The ratio of the amount of imports and exports of a country to the level of GDP	%GDP	WDI
8	*Agriculture*	The added value of the agriculture, forestry, and fisheries sectors to GDP. This variable reflects the informal sector of a country.	%GDP	WDI

Source: Author Compilation (2023)

3. Empirical Findings/Result and Discussion

Based on the results of data processing on *VAT* and *MisInv* obtained, complete and fixed data from observation units of 53 countries from 2002 to 2019 (18 years), the data structure is balanced panel data. Balanced panel data was chosen because it can provide more accurate information about the behavior of the object of study and is more appropriate for analyzing dynamic changes in the data studied. In addition, the balanced structure of the data panel is also appropriate, considering that this study also uses the dynamic data panel method in the estimation test. Table 2 displays a descriptive statistical summary of the study variables.

Table 2. Summary of Descriptive Statistics

Variabel	Obs	Mean	Std. Dev.	Min	Max
(a)	*(b)*	*(c)*	*(d)*	*(e)*	*(f)*
VAT (%GDP)	954	5,258	2,072	0,62	13,14
MisInv (Ln)	954	0,240	0,264	-0,67	1,2
Reg_quality (indeks)	954	2,277	0,391	1,2	3,5
VATrate (%)	954	15,468	3,578	7	21
Inflation (%)	954	6,069	5,966	-3,75	53,55
Openness (%GDP)	954	71,144	28,909	22,11	211,5
Agriculture (%GDP)	954	13,861	8,752	1,93	41,37

Source: STATA's output (2023)

The results according to the empirical model of equations (1) to (4) are presented in Table 3. The OLS model results in column (a) showed that *MisInv* positively affected the increase in VAT by 0.000315% of GDP. This model uses simple assumptions, so the estimation results indicated by the *MisInv* coefficient value (β_1) tend to be biased because the influence estimate value is greater than the actual influence value (over-estimated). The estimation results with two-way FEM in column (b) showed a 1% increase in *MisInv* had a negative and significant effect on *VAT* of 0.00293%. This result contradicts the previous explanation that controlling the potential influence of unobserved variables will result in a lower estimate of the influence value compared to the results with the OLS model. The estimation results also show a significant influence of other factors captured by dummy years, namely 2017 and 2018. The 2017

dummy showed a positive and significant influence on VAT of 0.289 units, while the 2018 dummy had a positive and significant effect on *VAT* of 0.257 units.

Finally, the study carried out the estimation test with GMM Model to overcome the endogeneity problem in the influence of *L.VAT* variables on *VAT*. Before running the GMM model estimation test, the root unit panel test results for all variables showed the results as shown in table 4. The table shows that all variables have a p-value below 0.05 or significant, so it is concluded that the panel data structure is stationary and testing using the GMM model can be carried out. The GMM estimation results in column (c) showed a difference in the value of the influence of *MisInv* on *VAT*, which was -0.00289% GDP.

Tabel 3. Summary of Estimation Results

	OLS	**FE with Time Effect**	**GMM with Time Effect**		
	(a)	(b)	(c)	(d)	(e)
	VAT	VAT	VAT	VAT	VAT
L.VAT	0.907***	0.572***	0.447***	0.421***	0.449***
	(0.0141)	(0.0277)	(0.0520)	(0.0362)	(0.0659)
MisInv	0.0315*	-0.293*	-0.289**	-0.686	2.246
	(0.0898)	(0.172)	(0.119)	(3.004)	(1.688)
Reg_quality	-0.00807	0.122	0.203**	0.0992	0.611**
	(0.0654)	(0.129)	(0.101)	(0.343)	(0.260)
VATrate	0.0353***	0.0633**	0.105***	0.0947***	0.0929***
	(0.00833)	(0.0245)	(0.0178)	(0.0228)	(0.0258)
Inflation	-0.000326	0.00329	-0.000344	0.00197	-0.00487
	(0.00400)	(0.00512)	(0.00182)	(0.00205)	(0.00450)
Openness	0.00328***	0.00336	0.00630***	0.00446**	0.00618**
	(0.00100)	(0.00213)	(0.00196)	(0.00215)	(0.00254)
Agriculture	-0.00718**	-0.0239**	-0.0411***	-0.0333***	-0.0432***
	(0.00320)	(0.0103)	(0.00922)	(0.00957)	(0.00928)
MisReg				0.124	
				(1.352)	
year.2003			-0.135	-0.251***	0.0588
			(0.0889)	(0.0828)	(0.157)
year.2004		0.0521	-0.0663	-0.126	0.122
		(0.123)	(0.0705)	(0.0795)	(0.132)
year.2005		0.0400	-0.103	-0.121	0.108
		(0.125)	(0.0741)	(0.0793)	(0.140)
year.2006		0.162	0.00491	-0.0154	0.109
		(0.126)	(0.0495)	(0.0910)	(0.129)
year.2007		0.125	0.0119	0.0359	0.217
		(0.128)	(0.0583)	(0.0778)	(0.169)
year.2008		0.113		-0.0286	0.149
		(0.133)		(0.0935)	(0.140)
year.2009		-0.168	-0.257***	-0.286***	-0.148
		(0.128)	(0.0619)	(0.0711)	(0.0992)
year.2010		0.114	0.00705	-0.0119	0.135

	OLS	**FE with Time Effect**	**GMM with Time Effect**		
	(a)	(b)	(c)	(d)	(e)
	VAT	VAT	VAT	VAT	VAT
		(0.128)	(0.0520)	(0.0849)	(0.120)
year.2011		0.158	-0.0127	0.0422	0.122
		(0.129)	(0.0585)	(0.0918)	(0.129)
year.2012		0.190	0.0162	0.0405	0.113
		(0.130)	(0.0735)	(0.0669)	(0.0804)
year.2013		0.168	0.0111	0.0368	0.133
		(0.130)	(0.0797)	(0.0683)	(0.0837)
year.2014		0.172	0.0800	0.0859	0.167
		(0.131)	(0.0534)	(0.0728)	(0.112)
year.2015		0.103	0.0197	-0.00105	0.136
		(0.132)	(0.0686)	(0.0740)	(0.0865)
year.2016		0.113	0.0100	0.000647	0.0938
		(0.131)	(0.0700)	(0.0705)	(0.0764)
year.2017		0.289**	0.105	0.133*	0.249***
		(0.133)	(0.0748)	(0.0674)	(0.0840)
year.2018		0.257*	0.120*	0.103	0.247***
		(0.135)	(0.0697)	(0.0673)	(0.0832)
year.2019		0.0788	-0.112		
		(0.136)	(0.104)		
MisInv*ECA					-1.552**
					(0.734)
MisInv*LAC					-0.809
					(1.149)
MisInv*MENA					-3.544*
					(2.107)
MisInv*SA					-1.723
					(1.846)
MisInv*SSA					-1.188
					(0.789)
Constant	-0.112	1.075**			
	(0.206)	(0.543)			
Observations	901	901	848	848	848
Number of id		53	53	53	53
R-squared	0.891	0.458			

Notes: Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1; ECA: *dummy East Asia & Pacific*, LAC: *dummy Latin America & Caribbean*, MENA: *dummy Middle East & North Africa*, SA: *dummy South Asia*; SSA: *dummy Sub-Sahara Africa* (*baseline: East Asia & Pacific*)

Source: STATA's output (2023)

Changes in the influence value also occur in other control variables but still significantly affect VAT, except for the inflation variable. In addition, the value and significance of the time effect also showed changes compared to the previous model, where the GMM model showed a dummy in 2009 and 2018, which had a significant effect on VAT. The test results showed that an increase of 1 unit of unobserved

variables in 2009 reduced *VAT* by 0.257 units. This factor is estimated to be the impact of the global economic crisis that occurred in the United States in 2008 and has an impact on almost all countries, including developing countries. On the other hand, the 2018 dummy showed a positive influence on *VAT* of 0.120 units. This result is due to the high economic growth in 2017 and the increasing trend in 2018.

The interpretation of the effect of MisInv on VAT in this study uses the basis of the GMM model. The GMM model can overcome the endogeneity problem that arises from the influence of dependent variable lag (*L.VAT*) and overcome the issue of endogeneity of MisInv variables from unobserved variables that have not been identified in the model and overcome with instrument variables using the variable lag. The results of the GMM model test show that a 1% increase in trade misinvoicing measures negatively affects VAT in developing countries by 0.00289% of GDP per year. These results are the first hypothesis proposed and correspond to the conclusions of several previous studies regarding the relationship of tax evasion to tax revenue (Asmah et al., 2020; Braml & Felbermayr, 2022; Ndiaye & Siri, 2016). Importers as economic agents tend to avoid VAT imposed when imported goods enter the importing country's territory. This avoidance is done by reducing the value of imported goods reported to customs institutions. The positive difference between the reported import value and the actual import value causes state revenue from VAT to be reduced. The reduction in VAT will increase if the import VAT administration system is not systematically connected with the administration of VAT on domestic trade, considering that the imported goods will be processed and resold in the domestic market. This happens because VAT is an imposition on the added value of selling imported goods. If the value is below the actual value, it will be detrimental to the government because the VAT will be lower than what should be received.

To ascertain whether the estimated results of the GMM model have been efficient, the Sargan test and the Arellano-Bond test were carried out. Sargan's test results show p-value>0.05 values, and it is concluded that the model estimates are valid or can be interpreted to mean that no instrument variables in the model correlate with errors. Furthermore, the Arellano Bond test results also showed a p-value at AR(2) > 0.05, and it was concluded that there was no autocorrelation in the second order. Based on the results of the two previous tests, the empirical test with the GMM model used by this study is appropriate and provides the best estimation results.

Table 5. Summary of Sargan Test Results and Arellano-Bond Test

Test	Statistical Value	*p-value*
Sargan	149,75	0,182
Arellano-Bond		
Order 1	-2,40	0,017
Order 2	0,28	0,780

Source: STATA's output (2023)

The result of the estimation test in column (d) of Table 3 shows that the effect of *MisInv*Reg_quality* on *VAT* is positive by 0.124 units but not significant. It shows that *regulatory quality* does not reduce the effect of *trade misinvoicing* on VAT proposed in the second hypothesis. It is indicated by insignificant values of β_1 and

values of θ up to $\alpha = 10\%$. These results follow Asmah et al., (2020), which showed an insignificant influence of *regulatory quality* in the relationship of *trade misinvoicing* with tax revenue through the GMM method. These results show that the government's efforts in optimizing tax revenues so far have focused more on growing tax revenues so that tax revenues are still predominantly determined by factors related to direct tax policy, such as rates and tax bases.

The estimation results also show the control variables' influence on the dependent variables and their influence in overcoming the endogeneity problem. *VATrate* shows a positive influence on *VAT*. These results correspond to previous studies (Andrejovská & Helcmanovská, 2021; Arrachman & Qibthiyyah, 2018; Sarmento, 2016) which state that a higher VAT rate will increase a country's VAT. Openness also shows a positive influence on VAT. The high dependence on imports will be in line with VAT considering that imports are one of the VAT bases (Arrachman & Qibthiyyah, 2018; Asmah et al., 2020; Keen, 2008). As a proxy for a country's informal sector, *agriculture* negatively influences *VAT*. The VAT system is not effective in the informal sector because informal companies tend to make transactions with other parties who have the same status (informal companies) VAT (Arrachman & Qibthiyyah, 2018; Keen & Lockwood, 2010). In addition, the agricultural sector is generally an exemption sector in the VAT revenue base, which will impact the loss of potential VAT. *Reg_quality* shows a positive influence on VAT. The result follows previous empirical studies that concluded that improving the institutional quality of a country has a positive effect on tax revenues (Lien, 2015; Sarmento, 2016). *L.VAT* has also been shown to have a positive effect on *VAT*. High revenues in the previous year will stimulate public spending the following year, leading to higher economic growth. Ultimately, higher economic growth will boost current tax revenues (Minh Ha et al., 2022). *Inflation* has been shown to have no significant effect on *VAT*. Inflation can increase tax revenues according to seigniorage theory but can also negatively affect revenues due to price increases that cause a decrease in consumption levels (Asmah et al., 2020)

This study also proves regions' influence on trade misinvoicing on VAT, as in column (e). The results show that trade misinvoicing in countries in *Europe & Central Asia* and the *Middle East & North Africa* region affects reducing *VAT*. Trade misinvoicing in both regions shows a significant influence because these regions apply higher VAT rates and experience more significant trade misinvoicing practices than other regions. So the impact of decreasing VAT becomes greater.

In the case of Indonesia, (GFI, 2020) stated that Indonesia was included in the ten countries with the enormous average trade misinvoicing value among developing countries in the 2008-2017 period. The trend of trade misinvoicing in Indonesia during 2002-2019 shows an increase and decrease in a certain period, as shown in figure 3. The decline in the trend from 2013 to 2018 is a good indicator of import services and supervision carried out by customs institutions in Indonesia. However, based on figure 4.10, it is also known that Indonesia's average trade misinvoicing is still much higher than the average of all developing countries. It shows that the significant level of

international trade in Indonesia is also accompanied by the significant level of trade misinvoicing that occurs in the trade, especially imports.

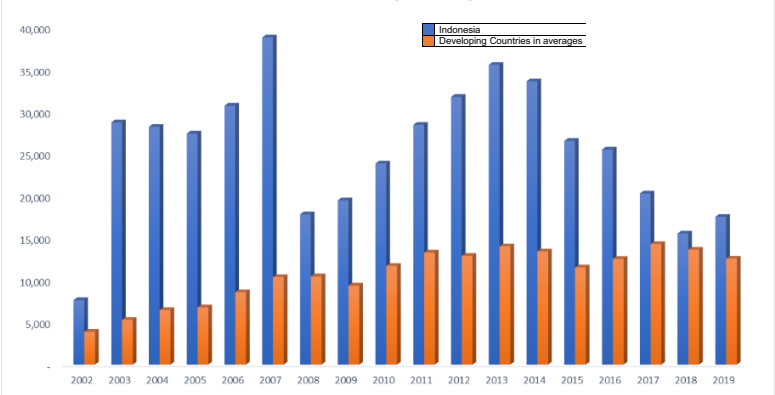

Figure 3. Trends in Indonesia's Trade Misinvoicing in 2002-2019
Source: WITS (2022)

As a member of the WTO and part of trade cooperation with several countries through the Free Trade Agreement (FTA), Indonesia is committed to reducing trade barriers through tariffs but does not apply to VAT rates. During the observation period of this study, it was known that the VAT rate in Indonesia is a single tariff and has not changed in value, which is 10%. However, on April 1, 2022, Indonesia's VAT rate will increase to 11% and 12% by 2025. The results of this study also show that the VAT rate has a positive effect on VAT, but the increase in the VAT rate also affects the increase in trade misinvoicing carried out by importers ((Mengistu et al., 2022; Yubiwini & Patunru, 2018)). For this reason, increasing the VAT rate to increase revenue still needs to be a concern for the Government of Indonesia, especially customs and taxation institutions. Policies that can be carried out by the Indonesian customs institution (Directorate General of Customs and Excise) include identifying commodities known to have differences in trade value in previous years and strengthening supervision, especially checking the suitability of the value of imported goods for these commodities, for tax institutions in Indonesia (Directorate General of Taxes) can supervise the suitability of import values in importer VAT reporting and the suitability of parties who make input credits on import VAT with parties who import.

4. Conclusions

This study aims to analyze the effect of trade misinvoicing on VAT in developing countries. It used descriptive analysis and empirical tests using data from 53 developing countries for the 2009–2019 period. The empirical test results using GMM Model showed that a 1% increase in trade misinvoicing was influential in reducing VAT to 0.00289% of GDP. The study also showed that countries in the Europe and Central Asia region and the Middle East and North Africa region affect the decline in VAT. Suggestions and input for developing country governments include increasing customs supervision of import activities. This study found that ensuring the VAT administration system gives each entity the right to credit input taxes can prevent tax evasion. It also showed a positive effect of policy quality on VAT. The government

in developing countries can play their role in creating a healthy international trade climate and supporting industrial development through suitable policy formulation. Customs and tax institutions need to identify commodities known to have had differences in trade values in previous years and strengthen supervision. Further studies should use a broader sample of developing country data and develop empirical model specifications, considering the potential for endogeneity in the trade misinvoicing variable.

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