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Unlocking the Mystery of Taxes and Inflation

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Abstract

Inflation can be defined as rising in prices over time and imposing new taxes or even increasing the current rates of taxes may increase these prices leading to a higher inflation rate. The broad inquiry in this study was about the effect of imposing taxes for the first time on the inflation rates and the main objective was to develop a model that uses corporate tax, VAT, and other controlling variables to predict the inflation rates after imposing taxes. The inflation rate used in this study was measured by both consumer price index and GDP deflator. A quantitative methodology was followed to explore the main issues of the study using data of some of GCC countries including United Arab Emirates, Qatar, Oman, and Saudi Arabia, in addition to Jordan and covering different periods based on the availability of data. Collected data were analyzed using OLS regression. The results of the study showed that VAT is not a significant variable to predict inflation rate after its imposing while corporate tax is significant in one country (Oman) and only when the inflation rate is measured using the GDP deflator.

Keywords: taxes and inflation, GCC, UAE, corporate tax, VAT, inflation

1. Introduction

Inflation occurs when the prices of goods increased continuously (Ridwan, 2022). Many factors can increase the inflation rate including the growth of gross domestic product (GDP), money supply, imports (Lim & Sek, 2015), and many others. The problem is that inflation can affect the economy by reducing its growth (Adaramola & Dada, 2020) while the specific problem is that the prices of goods and services may change with the change in taxes pushing the inflation rate up or down as evidenced by Campos-Vazquez and Esquivel (2020) and Adegbite (2019) and affecting the economy without being noticed. The main objective for conducting this study was to explore the effect of taxes on inflation rate by testing the extreme case of imposing corporate and value added taxes for the first time in some countries and develop a model to predict the new inflation rates after imposing these taxes in another country. To achieve this objective, countries of the United Arab Emirates (UAE), Oman, Saudi Arabia, Qatar, and Jordan were selected because they have newly first time imposed corporate tax and VAT. Data for Oman, Saudi Arabia, and Qatar were used to determine the effect of imposing corporate taxes on the inflation rates while data for Jordan were used to test the effect of imposing VAT for the first time on inflation. The effect of both: corporate taxes and VAT was then included in a model to predict the inflation rates in the UAE after imposing the new corporate tax and VAT.

Few studies were conducted to explore how taxes can affect inflation rates. For instance, Adegbite (2019) studied the effect of change in taxes rates on the inflation rates while Obaretin and Akhor (2019), GÜNEŞ (2020), and Bajpai (2021) tested the relationship between taxes revenues and inflation. In addition, Campos-Vazquez and Esquivel (2020) explored the effect of decreasing VAT rate on inflation while Makiyan, and Farashah (2023) tested the effect of tax changes on GDP and on inflation. It can be noticed from previous studies that it was focused on testing the effect of change in tax rates or tax revenues on inflation while in this study, the main purpose was to test the effect of introduction of tax for the first time on inflation rates and then use the results to predict the inflation rates after imposing taxes for the first time in UAE. This study may add new knowledge about the effect of taxes on inflation by revealing the effect of first time imposing of taxes instead of the effect of changing the tax rates. Studying the effect in this way, will clarify if the change does exist or not in a better way than studying the effect of changes in the tax rates because the effect is assumed to be stronger at the beginning of imposing new tax than at its consequent changes. Based on this, testing the effect of the first-time introduction of taxes on inflation can provide a clearer image for that effect. Parties who can benefit from the results of this study include tax regulators, financial policy makers, and creditors. Tax regulators can consider the results of this

study when preparing new tax policies and when making the decision of imposing new taxes by estimating how the new tax will affect inflation and the economy in general. Financial policy makers may use the results of this study in their financial plans considering the estimated inflation rate based on the taxes change while creditors and other users can use the results of this study to determine the real interest rate after estimating the inflation rate. The main hypothesis for the first part of this study was that the introduction of new corporate and VAT taxes does significantly affect the inflation rate. In the second part of this study, the results of the first part were used to predict the inflation rate in UAE after imposing new corporate tax and new VAT.

2. Literature Review

2.1 Inflation and Its Determinants

Inflation is a term commonly used to describe the continuous increase in prices of goods and services as explained by Alehegn (2021). Based on this definition, inflation is usually measured using the indicator of consumer price index (CPI) (Dharma et al., 2020). Increase in prices, or inflation, can be caused by many variables including the gross domestic product (GDP) (Alharthi, 2019), money supply (Batarseh, 2021), oil prices (Nusair, 2019), the value of imports and exports (Naseem, 2018), gross national expenditure and real interest rate (Badokhon & Rana, 2021). To control the inflation rate, the causes of inflation should be controlled to keep it within an acceptable level that does not harm the economy. If inflation is not controlled, this can impact the economic growth through lowering the GDP growth rate as evidenced by Tien (2021) and through increasing the unemployment rate as concluded by Santoso and Kristiyanto (2021). Furthermore, inflation can impact the economic growth of a country by reducing the foreign direct investment in that country (Hong & Ali, 2020) and by increasing the unequal distribution of income among the population (Law & Soon, 2020); inflation can even slow the financial development of the country in which it occurs (Dar & Nain, 2023). Because of all its negative consequences on the economy, inflation should be controlled and kept to a specific limit within which its impact is minimal to protect the economy and achieve the targeted economic and financial growth.

From the previous discussion of inflation consequences, it's clear that decreasing inflation rate should be a priority for governments to protect the economy and to foster financial and economic growth; one way to do that is to control the causes of inflation. For instance, central banks can control inflation through controlling the interest rates and money supply while government can control inflation through controlling its share of gross national expenditure. In addition, government can control inflation through its policies regarding the exports and imports of the country. Some causes of inflation are not controllable like oil prices which are determined by many factors outside the local control. Some researchers, however, claimed that inflation can be controlled through other ways including the enhancement of the independence of central banks (Garriga & Rodriguez, 2020), alignment of fiscal and monetary policies (Danh, 2021), controlling the exchange rate (Musa & Amuta, 2021), and implementing of Islamic monetary system (Anggara et al., 2023). From all these studies, it can be concluded that inflation is controllable but it's not known what is the complete set of tools that can be used to achieve the optimal inflation rate. In this study, the researcher tried to add taxes as a cause of inflation and as a new tool to control it.

2.2 How Taxes Can Affect Inflation

One tool that can be used to reduce inflation is taxes which can be used to control inflation by changing its policies (Adegbite, 2019). Tax affects inflation through affecting the business activity and consequently, the size of supply. For instance, if the tax rate was reduced, business activity will increase and then the supply of goods and services will increase because tax is a cost to producers and when cost go down, the production will go up pushing supply up and this will lead to a reduction in the prices which reduce inflation rate (Dzhabrailov, 2019). In addition, tax can affect inflation through its progressivity; if the progressivity of taxes increased, this will lead to increase in the persistence of inflation among the sectors of the economy (Geronikolaou et al., 2020). Governments can use indirect taxes (e.g., value added tax (VAT)) to control inflation through controlling the balance between supply and demand for goods and services. If demand side increased, governments can increase the indirect tax which will increase the prices and decrease the demand on the goods and services on which the tax was imposed. Eventually, the decrease in demand will decrease the prices of goods and services leading to lower inflation rate (Kaya et al., 2022). One caution in this last effect of tax is that indirect taxes should be imposed on a specific group of products and services that have the flexibility to reflect the tax effect on inflation and not on all products and services in the economy (Kaya et al., 2022). Based on this, it can be said that tax can affect inflation through the channel of supply and demand.

Personal income taxes and corporate income taxes may have different effects on inflation. An increase in the personal income taxes may decrease the net income after taxes which can lower the consumption and

consequently, reduce the prices of goods and services, and reduce inflation, as concluded by Cloyne et al. (2023). On the other hand, raising corporate tax may lower investment and this can negatively affect the supply side which may push the prices up and increase inflation; this mechanism for the effect of taxes on the supply and demand does not have the same strength on all goods and services but its stronger for a specific category of these goods and services (Cloyne et al., 2023). The relationship between taxes and inflation is not a one-direction relationship, as taxes can affect inflation, inflation also can affect taxes (Beer et al., 2023). Inflation can affect taxes through affecting the real value of nominal amounts of fines and penalties that are stated in the tax law using local currency. For example, tax that is imposed on alcohol drinks using fixed amounts rather than a percentage will lose its real value when inflation increases and thus, the main objective behind this tax (reducing alcohol consumption in the society) will not be achieved. Another effect for inflation is on the tax brackets stated in nominal values, when inflation increases, the nominal amount of income will increase moving taxpayers to higher brackets where they will be subject to higher tax rates. Finally, when inflation increases, the real interest rate imposed on the late tax payments or tax evasion cases is decreased leading to a lower revenue from these interest rates or even encourage taxpayers to delay tax payments if the real tax rate on the tax law is less than that in the market (Beer et al., 2023). To sum up, the relationship between taxes and inflation is well established in the literature as a two-way relationship; both inflation and taxes can affect each other in certain circumstances.

2.3 Tax in UAE, Jordan, Oman, Qatar, and Saudi Arabia

Some researchers have studied the effect of *changes* in tax on inflation while in this study, the objective was to test the effect of first-time introduction of taxes on inflation. This objective was achieved by studying how the introduction of tax for the first-time affected inflation in some countries and then try to predict that effect in UAE where taxes are also new. Countries included were Jordan, Saudi Arabia, Qatar, and Oman. These countries were selected because they nearly belong to the same economic environment. Jordan data were used to estimate the effect of VAT on inflation while data of other countries were used to test the effect of corporate tax. VAT was imposed for the first time in Jordan in January, 2001 (Fenochietto & Ménard, 2016) while in UAE, it was introduced in January, 2018 (PWC, 2023). It can be noticed here that VAT was imposed in Jordan before 17 years of imposing it in UAE which represents a good period to generate the effect on inflation if it exists. Regarding the corporate tax, it was introduced in Saudi Arabia in July, 2004 (Deloitte, 2022), introduced in January, 2010 in both Qatar (Qatar Financial Center, n.d.) and Oman (Malik & Singh, n.d.) while in UAE, it was introduced in June, 2023 (Corporate tax, 2024). The time gap between introducing corporate tax in UAE and the other included countries was at least 10 years which is enough to clearly notice the effect of this tax on inflation.

Studies about the effect of imposing taxes on inflation in the included countries are very limited but the effect can be expected based on the conclusions of many studies conducted in the other parts of the world. The effect of taxes on inflation was evidenced by GÜNEŞ (2020), Alrawashdeh et al. (2022), Campos-Vazquez and Esquivel (2020), Makiyan, and Farashah (2023), and Asandului et al. (2021). In most of previous studies, however, researchers tested the impact of changes in taxes on inflation which may provide different levels of signals about the effect depending on the magnitude of the tax change and this can result in misleading conclusions about the absence of the effect. In this study, I tested the effect of taxes on inflation in its extreme case, first-time introduction of tax, and not the effect of some changes. The logic here is that imposing tax for the first time will create a shock and generate a strong reaction by the prices of goods and services leading to a strong effect on inflation. In other words, if the effect exists, it will be easier to discover it at its maximum (after introducing tax for the first time) than at some levels of subsequent tax changes. Based on this proposed logic and guided by the conclusions of many previous studies, its hypothesized in this study that imposing direct and indirect taxes can affect inflation rate and thus, taxes can be added to the set of variables that can be used to predict the expected inflation rate in a country where taxes are newly imposed for the first time.

2.4 Hypotheses

As explained in the previous section, many researchers claimed that changes in taxes can affect inflation rate and based on this, it can be claimed that if changes in taxes can affect inflation, introducing taxes for the first time can generate the clearest effect if that effect really exists. In this study, however, the effect of introduction of taxes for the first time on inflation was tested using data of selected countries and then the results were used to predict inflation rate in the UAE. To test the mentioned effect, it was hypothesized that introducing taxes for the first time in a given country can significantly predict the inflation rate in that country. The main hypothesis for this study can be formulated as follows:

H1: First-time introduction of taxes can significantly predict inflation rate after controlling for other variables.

A set of variables other than taxes were added as control variables because these variables were claimed in

previous studies to have an impact on inflation rate in the included countries. The main hypothesis was tested first and then, the results were used to predict the expected inflation rate in UAE in which taxes were newly imposed.

3. Method

3.1 Research Data

Data used in this study were secondary data collected from many sources including the website of the world bank and the websites of governments in included countries. The dependent variable in this study was the inflation rate which was measured using consumer price index (CPI) because it's the popular indicator to reflect inflation as claimed by Dharma et al. (2020) and the GDP deflator which also can be used to measure inflation as claimed by Ha et al. (2023) and it was used to compare the results of CPI model. CPI and GDP deflator data for the included countries were downloaded from the world bank database and from indexmundi.com. The independent variables included a set of variables that were concluded to have a significant effect on inflation in each of the covered countries. These variables included crude oil prices (Adayleh, 2018), money supply (Alnefaee, 2018), GDP (Alharthi, 2019), value of exports and imports (Naseem, 2018), real interest rate (Badokhon & Rana, 2021), and growth of money supply (Al-bassam, 2016). Brent oil prices were used to represent the variable of oil prices for Jordan following Adayleh (2018); these prices were downloaded from the U.S. energy information administration (e.i.a). In addition, Dubai Fateh oil prices were used to represent the oil prices variable for the rest of included countries following Nusair (2019) and data about these prices were downloaded from statista.com. To include money supply in the regression analysis, data about money supply M2 were used and were downloaded from the world bank database and from the central bank of Oman. Data of value of exports, value of imports, real interest rate, growth of money supply, and GDP were downloaded from the database of the world bank. Downloaded data were analyzed using multiple linear regression by testing a model that contained a set of variables for each country selected based on the conclusions of the previous studies about that country. The period covered in this study was different for each country depending on the availability of data and data for the period of Covid-19 was excluded because of the effect of that pandemic. The period covered for Jordan was from 1987 to 2019, period for Oman was from 1984 to 2019, for Saudi Arabia from 1973 to 2017, for UAE from 1980 to 2019, and for Qatar, the time covered was from 1994 to 2019 for CPI model and from 2001 to 2019 for the GDP deflator model,

3.2 Research Design

The main purpose for this study was to explore the effect of taxes on inflation and then include taxes in a model to predict inflation rate; to achieve this purpose, a quantitative method of research was used. Multiple regression analysis was used to test the effect of many independent variables on inflation rate. The model used for each included country contained specific independent variables that were concluded to affect inflation in the previous studies and tax was added as an additional variable for each model. The same set of independent variables were used in two regressions for each country, the first regression was run with the CPI as the measure for inflation and the second regression was run with the GDP deflator as the measure of inflation. Analysis in this study was planned to be conducted in three steps, the first step is to test if the effect of taxes on inflation rate is significant for each country and the second step is to combine the significant effects into one value to use it in the third step which is developing a model to predict inflation rate based on the value of tax effect resulted from step two in addition to other control variables.

The variables of taxes in this study included income tax and VAT. Countries used in the first step (testing the effect of taxes on inflation) included Jordan (for VAT), Oman, Suadi Arabia, and Qatar (for corporate tax). The country used in the third step was UAE for which the prediction model was developed. For Jordan, variables concluded to influence inflation included oil prices (Adayleh, 2018), money supply (Batarseh, 2021), and GDP (Badokhon & Rana, 2021). Based on this, the regression model for Jordan was developed as follows after adding the VAT variable to test its effect:

$$IR = ß_0 + ß_1(OPB) + ß_2(MS) + ß_3(GDP) + ß_4(VAT) + \varepsilon \quad (1)$$

Where IR is the inflation rate (measured by CPI in one regression and GDP deflator in the second regression), OPB is the Brent crude oil prices, MS is the M2 money supply, GDP is the GDP of Jordan in constant local currency, and VAT is a dummy variable with a value of zero for years before imposing VAT in Jordan and one otherwise. The included period for Jordan was from 1987 to 2019. For Oman, variables that were concluded to have a significant effect on inflation included Dubai Fateh oil prices (Nusair, 2019), money supply (Basher & Elsamadisy, 2012), value of imports and real interest rate (Badokhon & Rana, 2021), and GDP (Alharthi, 2019). To test the effect of corporate income taxes, an additional variable (CITX) was added to these variables as

follows:

$$IR = ß_0 + ß_1(OPF) + ß_2(MS) + ß_3(IMP) + ß_4(RIR) + ß_5(GDP) + ß_6(CITX) + \varepsilon \quad (2)$$

Where IR is the inflation rate (measured by CPI in one regression and GDP deflator in the second regression), OPF is the Dubai Fateh crude oil prices, MS is the M2 money supply, IMP is the value of imports, RIR is the real interest rate, GDP is the GDP of Oman in constant local currency, and CITX is a dummy variable with a value of zero for years before imposing corporate income tax in Oman and one otherwise. Period for Oman was from 1984 to 2019. The model used to test the study hypothesis for Saudi Arabia included variables of Dubai Fateh oil prices (Nusair, 2019), money supply (Alnefaee, 2018), value of imports and value of exports (Naseem, 2018), and GDP (Badokhon & Rana, 2021). The following model was tested for Saudi Arabia:

$$IR = ß_0 + ß_1(OPF) + ß_2(MS) + ß_3(IMP) + ß_4(EXP) + ß_5(GDP) + ß_6(CITX) + \varepsilon \quad (3)$$

Where IR is the inflation rate (measured by CPI in one regression and GDP deflator in the second regression), OPF is the Dubai Fateh crude oil prices, MS is the M2 money supply, IMP is the value of imports, EXP is the value of exports, GDP is the GDP of Saudi Arabia in constant local currency, and CITX is a dummy variable with a value of zero for years before imposing corporate income tax in Saudi Arabia and one otherwise. The included period for Saudi Arabia was from 1973 to 2017. Variables included in the developed model for Qatar were Dubai Fateh oil prices (Nusair, 2019), value of imports (Bagadeem, 2020), and growth of money supply (Al-bassam, 2016). After adding taxes to these variables, the model for Qatar was developed as follows:

$$IR = ß_0 + ß_1(OPF) + ß_2(GMS) + ß_3(IMP) + ß_4(CITX) + \varepsilon \quad (4)$$

Where IR is the inflation rate (measured by CPI in one regression and GDP deflator in the second regression), OPF is the Dubai Fateh crude oil prices, GMS is the growth of M2 money supply, IMP is the value of imports, and CITX is a dummy variable with a value of zero for years before imposing corporate income tax in Qatar and one otherwise. Tested period for Qatar was from 1994 to 2019 for CPI inflation regression and from 2001 to 2019 for the GDP deflator inflation regression. The last developed model was for UAE which included variables of Dubai Fateh oil prices (Nusair, 2019), money supply (Basher & Elsamadisy, 2012), and GDP (Alharthi, 2019). The tested model for UAE was as follows:

$$IR = ß_0 + ß_1(OPF) + ß_2(MS) + ß_3(GDP) + \varepsilon \quad (5)$$

Where IR is the inflation rate (measured by CPI in one regression and GDP deflator in the second regression), OPF is the Dubai Fateh crude oil prices, MS is the M2 money supply, and GDP is the GDP of the UAE in constant local currency, the period used to test this model was from 1980 to 2019. After testing this model, the results can be included in a model that can be developed to forecast the inflation rate for UAE based on a set of variables including tax. The final prediction model can be as follows:

$$IR = ß_0 + ß_1(OPF) + ß_2(MS) + ß_3(GDP) + ß_4(CITX) + ß_5(VAT) + \varepsilon \quad (6)$$

where $ß_5$ represents the effect of VAT resulted from testing the model in Equation 1 and $ß_4$ represents the effect of corporate income tax resulted from testing the models in Equations 2, 3, and 4. $ß_4$ can be calculated using the weighted average method that is used in a machine learning technique known as "ensemble learning" where the results of many models are combined using the weighted average of its results (Matloob et al., 2021). A higher weight is given to the model with higher adjusted R^2 and then that weight is multiplied by ß value for the variable (CITX) in that model. The following equation clarifies how $ß_4$ can be calculated:

$$ß_4 = \sum W_i * ß_i \quad ; \sum W_i = 1 \quad (7)$$

where $ß_i$ is beta value for the variable (CITX) in the model i (equations 2,3, and 4) and Wi is the weight of the model i based on its R^2 and its calculated as:

$$W_i = \text{Model rank (1,2, or 3)} / 6 \quad (8)$$

Based on this, the weight for the model with the highest adjusted R^2 is .5 (3/6), for the next model is .34 (2/6), and for the last model in the ranking its .16 (1/6).

4. Results

4.1 Descriptive Statistics

The mean and standard deviation for all the variables included in the models of the included countries are reported in Table 1. It can be noticed from the table that Jordan had the highest average of CPI inflation rate during its covered period and Suadi Arabia had the highest average of GDP deflator inflation rate. Oman had the

lowest CPI inflation rate while UAE had the lowest GDP deflator inflation rate; in addition, Saudi Arabia was the country with the most volatile CPI and GDP deflator inflation rate during its covered period. The least volatile CPI inflation was in UAE while the least volatile GDP deflator inflation rate was in Jordan. The volatility of Dubai Fateh oil prices was almost the same during the covered periods for all countries that have this variable.

Table 1. Descriptive Statistics for the Study Variables

Variable / Average and (SD)	Jordan	Oman	Saudi Arabia	Qatar	UAE
Average (CPI) inflation rate % (SD)	4.485 (5.200)	1.665 (3.457)	3.818 (7.823)	3.394 (4.518)	3.927 (3.031)
Average (GDP deflator) inflation rate % (SD)	4.583 (5.054)	3.765 (13.190)	8.440 (24.084)	4.705 (13.928)	3.136 (7.468)
Brent oil prices U.S.$ (SD)	46 (32)	-	-	-	-
Money supply (in millions LCU) (SD)	14,491 (11,085)	5,596 (5,493)	499,941 (552,642)	-	395,845 (450,615)
GDP (in millions LCU) (SD)	17,745 (7,422)	20,950 (7,909)	1,474,888 (521,221)	-	817,262 (375,313)
Dubai oil prices U.S.$ (SD)	-	42 (31)	36 (29)	51 (31)	41 (29)
Imports (in millions LCU) (SD)	-	5,792 (4,985)	300,261 (271,749)	104,085 (89,962)	-
Real interest rate% (SD)	-	5.881 (14.057)	-	-	-
Exports (in millions LCU) (SD)	-	-	445,499 (419,616)	-	-
Growth of money supply % (SD)	-	-	-	15.279 (13.145)	-

Note: Cells with (-) means that the variable was not included in the model for that country.

4.2 Hypothesis Testing

4.2.1 Jordan

The main hypothesis for this study was developed to test whether the first-time introduction of taxes can predict the inflation rate. For Jordan, this hypothesis can be stated as follows:

H1: First-time introduction of VAT can significantly predict inflation rate after controlling for other variables.

Before testing this hypothesis using the developed model for Jordan in Equation 1, an outlier check was conducted and one outlier was detected which was replaced with the median of other values. After that, the assumptions of linear regression were tested and the results indicated that the assumptions of normality, multicollinearity, and stationarity were violated. To resolve the violation of normality, all variables in the model were transformed to log except for the VAT variable while the problem of multicollinearity was fixed by removing the variable of GDP from the model because it was the source of the multicollinearity. Finally, the non-stationarity of data was ignored because the variables were cointegrated based on the results of Phillips-Ouliaris cointegration test. The final tested model for Jordan was as follows:

$$\text{Log (IR)} = ß_0 + ß_1(\text{Log (OPB)}) + ß_2(\text{Log (MS)}) + ß_3(\text{VAT}) + \varepsilon \quad (9)$$

Where Log (IR) is the logarithm to the base of 10 of inflation rate (measured by CPI in one regression and GDP deflator in the second regression), Log (OPB) is the logarithm of Brent crude oil prices, Log (MS) is the logarithm of M2 money supply, and VAT is a dummy variable with a value of zero for years before imposing VAT in Jordan and one otherwise. The results of running this regression model are summarized in Table 2. When using the CPI inflation rate, the model was significant at 5% level, $F(3,29) = 5.143$, $p = .006$, the Brent oil prices

had a positive and significant effect on the inflation rate while the money supply had a negative and significant effect. VAT had a negative but insignificant effect on the inflation rate. When the inflation rate was measured by the GDP deflator, the regression model was insignificant, $F(3,29) = 2.625$, $p = .069$, Brint oil prices continued to be significant while money supply became insignificant and VAT continued to be insignificant. Based on these results, the null hypothesis cannot be rejected and it can be said that first-time introduction of VAT cannot significantly predict inflation rate for Jordan.

Table 2. Results of Regression Model for Jordan

Details	Log (OPB)	Log (MS)	VAT
Using CPI inflation			
β	1.185	-0.899	-0.097
P value	.001	.004	.587
Adjusted R square	.347		
Using GDP deflator inflation			
β	1.004	-0.565	-0.092
P value	.010	.090	.645
R square	.214		

4.2.2 Oman

The same hypothesis for Jordan was tested for Oman but with the using of corporate income tax instead of VAT that was used in Jordan. The tested hypothesis for Oman was as follows:

H1: First-time introduction of corporate income tax can significantly predict inflation rate after controlling for other variables.

Before testing this hypothesis, collected data were checked for outliers and tested for the assumptions of multiple linear regression. Results showed that the data were free of outliers while assumptions related to autocorrelation, multicollinearity, and stationarity were violated. The problem of multicollinearity was resolved by removing the variables of GDP and imports from the model in Equation 2 because they are the source of this problem. The problem of nonstationary was removed by taking the first-order difference for all variables except for CITX. After removing all violations of assumptions, the final regression model for Oman was as follows:

$$FDIR = ß_0 + ß_1(FDOPF) + ß_2(FDMS) + ß_3(FDRIR) + ß4(CITX) + \varepsilon \quad (10)$$

Where FDIR is the first-order difference for the inflation rate (measured by CPI in one regression and GDP deflator in the second regression), FDOPF is the first-order difference of Dubai Fateh crude oil prices, FDMS is the first-order difference of M2 money supply, , FDRIR is the first-order difference of real interest rate, and CITX is a dummy variable with a value of zero for years before imposing corporate income tax in Oman and one otherwise. Table 3 shows the results of running this regression. The results of the regression with the CPI inflation indicated that the model was insignificant at 5% level, $F(4,30) = 0.810$, $p = .529$ and all the independent variables were insignificant. The results of the same regression model but using the GDP deflator as a measure for the inflation rate revealed that the model was significant $F(4,30) = 484.037$, $p < .001$. Both the oil prices and money supply were insignificant while real interest rate and corporate tax were significant. Based on these results, the null hypothesis cannot be rejected when using the CPI inflation rate while it can be rejected when using the GDP deflator as a measure of inflation rate and it can be concluded that first-time introduction of corporate tax in Oman can significantly predict the inflation rate. I drew this conclusion because the GDP deflator measures the change in prices of all goods in the economy while the CPI measures the change in prices of only a basket of goods that the consumer usually purchases.

Table 3. Results of Regression Model for Oman

Details	FDOPF	FDMS	FDRIR	CITX
Using CPI inflation				
β	0.042	<0.001	-0.022	-1.630
P value	.465	.446	.552	.359
R square	.097			
Using GDP deflator inflation				
β	-0.055	<0.001	-0.952	-2.862
P value	.198	.060	<.001	.033
R square	.985			

4.2.3 Saudi Arabia

The main hypothesis for Saudi Arabia was not different than that for Oman:

H1: First-time introduction of corporate income tax can significantly predict inflation rate after controlling for other variables.

Before testing this hypothesis, the same tests for outliers and linear regression assumptions that were conducted for Jordan and Oman were also conducted on the data of Saudi Arabia. The results for these tests indicated that data are free from outliers while the assumptions related to normality, multicollinearity, and stationarity were violated. The problem of non-normal distributed errors was solved by the taking the log of all variables and the problem of multicollinearity was solved by removing the variables of oil prices, imports, and exports from the model in Equation 3 because it was the source of multicollinearity. Regarding the problem of nonstationary, it was solved by taking the second-order difference for the log of all variables because the cointegration test indicated that the variables are not cointegrated. The final tested model for Saudi Arabia was:

$$\text{NDFLog (IR)} = ß_0 + ß_2(\text{NDFLog (MS)}) + ß_3(\text{NDFLog (GDP)}) + ß_4(\text{CITX}) + \varepsilon \quad (11)$$

Where NDFLog (IR) is the second-order difference of the log of inflation rate (measured by CPI in one regression and GDP deflator in the second regression), NDFLog (MS) is the second-order difference of the log of M2 money supply, NDFLog (GDP) is the second-order difference of the log of GDP of Saudi Arabia in constant local currency, and CITX is a dummy variable with a value of zero for years before imposing corporate income tax in Saudi Arabia and one otherwise. The results of running this model are summarized in Table 4. When using CPI to measure inflation, the model was insignificant at 5% level, $F(3,39) = 0.579$, $p = .632$ and all the independent variables were insignificant while when using the GDP deflator as a measure for inflation, the model was significant, $F(3,39) = 4.485$, $p = .008$ and all variables are significant except for the corporate tax (CITX). Based on these results, the alternative hypothesis cannot be accepted and it can be concluded that first-time introduction of corporate income tax in Saudi Arabia cannot significantly predict inflation rate.

Table 4. Results of Regression Model for Saudi Arabia

Details	NDFLog (MS)	NDFLog (GDP)	CITX
Using CPI inflation			
β	0.745	0.878	-0.011
P value	.517	.250	.895
R square	.043		
Using GDP deflator inflation			
β	-8.409	-4.385	-0.003
P value	.005	.025	.987
R square	.257		

4.2.4 Qatar

The hypothesis tested for Qatar was as follows:

H1: First-time introduction of corporate income tax can significantly predict inflation rate after controlling for other variables.

Before testing this hypothesis, Qatar data were tested for outliers and for the linear regression assumptions like the data of other countries. The results of these tests indicated that data are free from outliers while the assumptions of normality and stationarity were violated. The problem of normality was solved by transforming the inflation rate using data reflection (Log (maximum value + 1 – the variable value) because the residuals in the model were negatively skewed while the problem related to stationarity was solved by taking the second-order difference of all variables. The final model that was tested for Qatar was a s follows:

$$NDFRIR = ß_0 + ß_1(NDFOPF) + ß_2(NDFGMS) + ß_3(NDFIMP) + ß_4(CITX) + \varepsilon \quad (12)$$

Where NDFRIR is the second-order difference of the reflected inflation rate (measured by CPI in one regression and GDP deflator in the second regression), NDFOPF is the second-order difference of Dubai Fateh crude oil prices, NDFGMS is the second-order difference of growth of M2 money supply, NDFIMP is the second-order difference of the value of imports, and CITX is a dummy variable with a value of zero for years before imposing corporate income tax in Qatar and one otherwise. The results of running this model are shown in Table 5. The results indicated that when measuring inflation using CPI, the model was significant, $F(4,19) = 7.156$, $p = .001$and all variables were insignificant except for the oil prices while when using the GDP deflator as a measure of inflation in the model, the model became insignificant, , $F(4,12) = 1.123$, $p = .391$ and all independent variables became insignificant. Based on this, the alternative hypothesis cannot be accepted and it can be said that first-time introduction of corporate income tax in Qatar cannot significantly predict inflation rate.

Table 5. Results of Regression Model for Qatar

Details	NDFOPF	NDFGMS	NDFIMP	CITX
Using CPI inflation				
β	-0.016	-0.001	<0.001	-0.150
P value	<.001	.785	.804	.272
R square	.601			
Results of Regression Model for Qatar				
Using GDP deflator inflation				
β	-0.020	-0.007	<0.001	-0.080
P value	.093	.509	.615	.854
R square	.272			

4.2.5 UAE

The hypothesis tested for UAE was the same as for other countries:

H1: First-time introduction of corporate income tax can significantly predict inflation rate after controlling for other variables.

Data for UAE, like data of other countries, were tested for the existence of outliers and for the linear regression assumptions. The results showed that the data were free of outliers and the assumptions related to multicollinearity and stationarity were violated. The problem of multicollinearity was solved by removing the variable of GDP from Equation 5 because it was the source of multicollinearity while the problem related to stationarity was solved by taking the first-order difference for all variables. The final tested model for UAE was as follows:

$$FDIR = ß_0 + ß_1(FDOPF) + ß_2(FDMS) + \varepsilon \quad (13)$$

Where FDIR is the first-order difference for the inflation rate (measured by CPI in one regression and GDP deflator in the second regression), FDOPF is the first-order difference for Dubai Fateh crude oil prices, and FDMS is the first-order difference for the M2 money supply. The results of this regression are clarified in Table 6. These results revealed that when including the CPI inflation in the regression, the model was insignificant, , $F(2,36) = 2.277$, $p = .117$ and only the variable of oil prices was significant while when using the GDP deflator

inflation, the model became significant, F(2,36) = 10.764, p <.001 with also one significant variable (oil prices).

Table 6. Results of Regression Model for UAE

Details	FDOPF	FDMS
Using CPI inflation		
β	0.063	<0.001
P value	.048	.666
R square	.112	
Using GDP deflator inflation		
β	0.452	<0.001
P value	<.001	.326
R square	.374	

4.3 Tax-Based Prediction Model for UAE

The results in the previous sections revealed that VAT was not significant in predicting inflation rate while corporate tax was significant in one country (Oman). Based on this, the proposed calculations for the parameter of the tax variable in Equations 7 and 8 cannot be used. Corporate tax can be included in a model to predict inflation in UAE while VAT is excluded. In addition, the variable of Dubai Fateh crude oil prices can be included in the prediction model because it was significant in predicting inflation in UAE. Because all the included countries are from the same region and have many similar attributes, variables that were significant in the models of these countries can be added to the proposed prediction model for UAE. Based on this, two models can be developed using the regression results for the CPI inflation and GDP deflator inflation of all countries: one model includes the dependent variable of CPI inflation rate and the independent variable of Dubai Fateh crude oil prices while the second model includes the dependent variable of GDP deflator inflation rate and the independent variables of real interest rate, money supply, GDP, and corporate tax. The first model can be expressed as follows:

$$IR = -0.490 + 0.063(OPF) \quad (14)$$

Where IR is the CPI inflation rate and OPF is the Dubai Fateh crude oil prices.

The second proposed model was as follows:

$$IR = 0.357 + 0.452(OPF) - 2.862(CITX) \quad (15)$$

Where IR is the GDP deflator inflation rate, OPF is the Dubai Fateh crude oil prices. The value of CITX variable is always one because the model will be used to predict inflation rate after the imposing of corporate tax in UAE and not for periods before and after corporate tax as in the models of other countries so only the value of its ß appears in the model. The value of ß for the CITX variable was taken from the results of Oman regression using the GDP deflator inflation which was -2.862. based on this, the second model can be re-written as:

$$IR = 0.357 + 0.452(OPF) - 2.862 \quad (16)$$

5. Discussion

The results of data analysis in the previous section revealed that the first-time introduction of VAT in a country is not a significant variable to predict what will happen to inflation rate in that country and imposing this tax does not significantly affect the inflation rate. On the other side, corporate tax has a significant negative effect on the inflation rate if measured using the GDP deflator in one of the included countries which means that it can be used to predict the inflation rate after being imposed for the first time in the economy. Based on these results, two models were developed to predict inflation rate in the UAE, one to predict CPI inflation rate and the other was to predict the GDP deflator inflation rate. The results of this study regarding the VAT are opposite to the conclusions of Alrawashdeh et al. (2022) who concluded that indirect taxes have a significant and positive effect on CPI inflation in Jordan, opposite to the results reached by Makiyan, and Farashah (2023) which indicated that VAT has a negative relationship with inflation, and opposite to the conclusions of Milenković et al. (2020) who claimed that VAT has a significant effect on CPI inflation. However, the VAT results are in line with the results of

Obaretin and Akhor (2019) who concluded that VAT has no significant effect on inflation. On the other hand, results of this study regarding the corporate tax support the results reached by Asandului et al. (2021) and Bajpai (2021) who concluded that income taxes have a negative relationship with inflation and contradict the conclusions of GÜNEŞ (2020) which indicated that taxes revenues have a positive relationship with inflation. Finally, the results of this study regarding corporate tax do not support the results of Akpan et al. (2024) who claimed that income tax has a significant effect on inflation when measured using the CPI. There are no previous studies with the same objective as this study which is testing the effect of first-time introduction of taxes and based on this, comparison with the results of previous studies may not give the exact position of this study among the previous studies but may provide an indicator about that position.

The results of this study are generalizable to other countries in the region because it included many countries and not only one and because the covered years are all normal years without any years with pandemics or wars. This study is the first study to explore the effect of the first-time imposing of taxes on the inflation rate and based on this, it may provide new and strong evidence about the effect of taxes on inflation. This study can add value to the literature by clarifying the effect of taxes on inflation in its extreme (the first-time imposing) rather than the effect of changes on tax rates. Results of this study can be used by tax regulators to estimate the effect of imposing new taxes on inflation before taking the decision to introduce taxes. In addition, the results of this study are beneficial for financial policy makers who can consider it when preparing financial plans based on the estimated inflation rate and for creditors and other users who can use the results to estimate the real interest rate by considering the tax-based predicted inflation rate. Finally, the conclusions of this study can be supported by future research about the effect of imposing new taxes on inflation in different regions across the world and by conducting more research about the mechanisms of this effect.

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